



**Sampling and Analysis Plan for  
Remedial Investigation**

**Lane Plating Works, Inc. Superfund Site  
Dallas, Dallas County, Texas  
EPA Identification No. TXN000605240**

**Remedial Action Contract 2 Full Service  
Contract No.: EP-W-06-004  
Task Order No.: 68HE0618F0309**

*Prepared for*

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Region 6  
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*Prepared by*

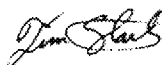
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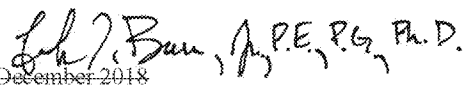


~~2019~~December 2018

Tim Startz  
EA Program Manager

~~15~~ March

Date



~~December 2018~~

Frank Barranco, P.E., P.G., PhD (EA)  
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~~15~~ March 2019

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Date

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**LIST OF ACRONYMS AND ABBREVIATIONS**

ASG	Active soil gas
AVS/SEM	Acid volatile sulfide/simultaneously extracted metals
bgs	Below ground surface
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-custody
COPC	Contaminant of potential concern
CRQL	Contract Required Quantitation Limit
DPT	Direct-Push Technology
DQA	Data quality assessment
DQO	Data quality objective
EA	EA Engineering, Science, and Technology, Inc., PBC
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft.	Feet (foot)
FS	Feasibility Study
HASP	Health and Safety Plan
HRS	Hazardous Ranking System
HSA	Hollow-stem auger
HWTB	Hazardous Waste Treatment Building
IDW	Investigation-derived waste
in.	Inch (inches)
ITRC	Interstate Technology Regulatory Council
LCS	Laboratory control sample
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
mg/kg	Milligram(s) per kilogram
MD	Matrix Duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
NOE	Notice of Enforcement
ORP	Oxidation-reduction potential

**LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)**

OSHA Occupational Safety and Health Administration

**LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)**

PA Preliminary Assessment  
 PARCCS Precision, accuracy, representativeness, completeness, comparability, sensitivity  
 PFC Perfluorinated compounds/chemicals  
 PCB Polychlorinated biphenyls  
 PPE Personal protective equipment  
 PSG Passive soil gas  
 PSI Pounds per square inch  
 PVC Polyvinyl chloride  
 PWS Public water supply

QA Quality assurance  
 QAPP Quality Assurance Project Plan  
 QC Quality control

RA Removal Assessment  
 RAC Remedial Action Contract  
 RI Remedial Investigation  
 ROD Record of Decision  
 RPD Relative percent difference  
 RSL Regional Screening Level

SAP Sampling and Analysis Plan  
 SCDM Superfund Chemical Data Matrix  
 site Lane Plating Works, Inc. Superfund Site  
 SOP Standard operating procedure  
 SOW Statement of Work  
 SVOC Semi-volatile organic compound

TAC Texas Administrative Code  
 TAL Target Analyte List  
 TCEQ Texas Commission on Environmental Quality  
 TDS Total dissolved solids  
 TOC Total organic carbon  
 TOM Task Order Monitor  
 TPH Total Petroleum Hydrocarbon  
 TSS Total suspended solids  
 TXDWW TCEQ Texas Drinking Water Watch

VOC Volatile organic compound

## 1. PROJECT DESCRIPTION AND MANAGEMENT

EA Engineering, Science, and Technology, Inc. PBC (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract (RAC) II No. EP-W-06-004, Task Order 68HE0618F0309, to conduct a Remedial Investigation (RI) at the Lane Plating Works, Inc. Superfund Site (site). EA has prepared this Sampling and Analysis Plan (SAP) in accordance with: ~~(1) specifications provided in the EPA Statement of Work (SOW) (EPA 2018c), (2) the 5 September 2018 EPA response to EA Questions on the SOW, (3) a scoping meeting held via teleconference call on 6 September 2018, (4) the EPA-approved EA Work Plan (EA 2018a), and (5) 40 Code of Federal Regulations (CFR) 300.415(b)(4)(ii), and per comments received from the EPA and the Texas Commission on Environmental Quality (TCEQ).~~

This SAP is a combination Quality Assurance Project Plan (QAPP) and Field Sampling Plan. It details data collection methods, proposed sample locations and frequency, sampling equipment and procedures, and analytical methods required to collect sufficient data for the RI activities at the site. Combining these two standard deliverables into a single document allows a streamlining of the planning process, while ensuring that data collected are of sufficient quality for its intended use. Table 1 below demonstrates how this SAP addresses all elements of a QAPP required by EPA for planning documents at hazardous waste sites (EPA 2001, 2002).

**Table 1. Elements of EPA Quality Assurance Project Plans QA/R-5 in Relation to this SAP**

EPA QA/R-5 QAPP Element		EA SAP
A1	Title and Approval Sheet	Title and Approval Sheet
A2	Table of Contents	Table of Contents
A3	Distribution List	Distribution List
A4	Project/Task Organization	1.0 Project Description and Management
A5	Problem Definition/Background	1.1 Problem Definition and Background
A6	Project/Task Description	1.2 Description of Project Objectives and Tasks
A7	Quality Objectives and Criteria	1.3 Data and Measurement Quality Objectives
A8	Special Training/Certification	1.4 Special Training Requirements and Certification
A9	Documents and Records	1.5 Documents and Records
B1	Sampling Process Design	2.1 Sampling Process Design
B2	Sampling Methods	2.3 Sampling Methodology
B3	Sample Handling and Custody	2.3 Sample Handling and Custody
B4	Analytical Methods	2.4 Analytical Methods Requirements
B5	Quality Control	2.5 Quality Control Requirements
B6	Instrument/Equipment Testing, Inspection, and Maintenance	2.6 Instrument and Equipment Testing, Inspection, and Maintenance Requirements
B7	Instrument/Equipment Calibration and Frequency	2.7 Instrument Calibration and Frequency
B8	Inspection/Acceptance of Supplies and Consumables	2.8 Requirements for Inspection and Acceptance of Supplies and Consumables
B9	Non-Direct Measurements	2.9 Data Acquisition Requirements (Non-Direct Measurements)
B10	Data Management	2.10 Data Management



EPA QA/R-5 QAPP Element		EA SAP	
C1	Assessment and Response Actions	3.1	Assessment and Response Actions
C2	Reports to Management	3.2	Reports to Management
D1	Data Review, Verification, and Validation	4.1	Data Review and Reduction Requirements
D2	Validation and Verification Methods	4.2	Validation and Verification Methods
D3	Reconciliation with User Requirements	4.3	Reconciliation with Data Quality Objectives
NOTES: EA = EA Engineering, Science, and Technology, Inc. PBC EPA = U.S. Environmental Protection Agency QAPP = Quality Assurance Project Plan SAP = Sampling and Analysis Plan			

Upon implementation, this SAP should be used in conjunction with the site-specific Health and Safety Plan (HASP) (EA 2018b).

This SAP has been prepared in accordance with EA's Quality Management Plan (EA 2014) and meets requirements set forth in *EPA Requirements for Quality Assurance Project Plans (QA/R-5)* (EPA 2001) and *Guidance for Quality Assurance Project Plans (QA/G-5)* (EPA 2002).

This SAP details the project specific data quality objectives (DQOs) and describes procedures to ensure that the DQOs are met and that the quality of data (represented by precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) is known and documented. The SAP presents the project description, project organization and responsibilities, and quality assurance (QA) objectives associated with the sampling and analytical services to be provided in support of RI activities at the site.

The overall QA objectives are as follows:

- Obtain data of known quality to support goals set forth for the RI
- Attain quality control (QC) requirements for analyses as specified in this SAP
- Document all aspects of the quality program including performance of the work and any required changes to work at the site.

The EPA Region 6 Task Order Monitor (TOM), Mr. Stephen Pereira, is responsible for the project oversight. The Project Officer for EPA Region 6 is Mr. William G. Johnson, Jr. The Contracting Officer for EPA Region 6 is Mr. Brian Delaney. EA will perform all tasks under this Task Order in accordance with this SAP. The EA Project Manager, Mr. Mark Paddock, is responsible for implementing all activities required by this Task Order. Figure 1 presents the proposed project organization for this Task Order.

## 1.1 PROBLEM DEFINITION AND BACKGROUND

This section describes the following:

- Purpose of the investigation (Section 1.1.1)

- Site background and history (Section 1.1.2)
- Summary of previous investigations (Section 1.1.3)
- Site description (Section 1.1.4).

### 1.1.1 Purpose of the Investigation

The purpose of this investigation is to conduct an RI at the site to develop a remedy that eliminates, reduces, or controls risk to human health and the environment. The goal is to collect an adequate amount of data necessary to support the selection of an approach for site remediation that can be used to support a Record of Decision (ROD). A phased sampling approach will be used to collect the RI data, and additional phases of RI sampling may be required to produce enough information to develop the ROD. The EPA Task Order SOW (EPA-2018c) and EPA-approved Work Plan (EA-2018a) set forth the framework and requirements for this effort.

### 1.1.2 Site Background and History

Based on information adapted from the 2018 Hazardous Ranking System (HRS) Documentation Record (EPA 2018a), the site is located at 5322 Bonnie View Road, approximately five miles south of downtown Dallas, Dallas County, Texas (Figure 2). It is situated immediately east of Bonnie View Road on 4.6 acres and is surrounded on all sides by open or wooded land. Land use is listed as residential and commercial in the area. The original facility building and adjacent structures are still present and include the main facility building where the majority of electroplating operations took place, a shed structure known as the Hazardous Waste Treatment Building (HWTB), and a former wastewater treatment building and miscellaneous tractor trailers located south of the facility and HWTB. A barbed wire and locked chain-link fence surrounds the property.

Asphalt/concrete cover extends from the facility entrance to the driveway and footprint around the facility building. Soil and vegetation are exposed on all other sides. Two old, unused water wells are located on the north side of the facility building. Old equipment and trash surround the facility in open and wooded areas located to the east and south. According to the Dallas Central Appraisal District, the office building was built in 1950, and the facility property is currently owned by Stag Management, Inc., with John R. Lane listed as president. Stag Management, Inc. also owns the adjoining property located east of the facility at 5156 Bonnie View Road, and the Lane residence is located approximately 500 feet (ft.) north of the facility. Bankruptcy schedules show that Lane Plating Works, Inc. owns equipment and accounts receivables and leases the 5322 Bonnie View Road property from Stag Management, Inc. The closest residences are located approximately 200 to 300 ft. west of the facility along Bonnie View Road, and a baseball diamond is located approximately 650 ft. south of the facility. There are no daycare facilities, schools, or churches located in the immediate vicinity of the close proximity to the facility. However, as indicated on Figure 2, there are several day care facilities, schools, a college, and other receptors located in the surrounding community.

The site was historically occupied by a former electroplating facility that conducted primarily hard chromium and cadmium plating for approximately 90 years until 2015. Additional

processes included chromate dips, chromic acid anodize, hard chrome plating using chromic acid, cadmium plating, copper plating using copper cyanide, zinc plating aluminum using nitric acid and zinc cyanide, nickel plating using nickel sulfate, black oxide coating, electroless nickel, passivation, machining and grinding, stripping of metal parts in acid, pretreatment of metal parts using sodium hydroxide and sulfuric acid, operating a lead melting pot to repair anodes used in plating baths, and electroplating wastewater treatment. Resource Conservation and Recovery Act and TCEQ Texas Commission on Environmental Quality (TCEQ) Notice of Registration records document the following waste streams: corrosive and reactive waste, cadmium, chromium, lead, spent chromic acid solution, spent muriatic acid, chromate, metals filings and dust, cyanide waste, caustic waste, caustic soda solid (tank bottoms), and wastewater treatment sludges from electroplating operations. Operations ceased in 2015 with numerous violations, investigations, and bankruptcy.

### 1.1.3 Summary of Previous Investigations

Based on information adapted from the 2018 HRS Document Record (EPA 2018a), the site has been investigated by several state and federal agencies over the past 40 years, and releases of plating wastes to onsite soils have been documented by recent investigations. TCEQ conducted investigations at the site in February 2010 and January 2011. Analytical results from soil samples collected from a waste pile and around the facility foundation indicated leachable cadmium, chromium, lead, and mercury concentrations. Formal enforcement action was requested based on numerous violations, including the failure to obtain a permit prior to disposal of hazardous waste and to prevent unauthorized discharge of industrial solid waste. A Notice of Enforcement (NOE) letter and a Proposed Agreed Order were transmitted to the facility in April and July 2011, respectively, with a total penalty of \$28,350. TCEQ conducted a follow-up investigation in October 2014 and noted several additional issues and alleged violations of waste management, including the failure to install a secondary containment unit for a hazardous waste tank. Onsite soil samples indicated total chromium, hexavalent chromium, antimony, arsenic, cadmium, mercury, and nickel detections above the EPA Superfund Chemical Data Matrix (SCDM) soil exposure pathway benchmarks and lead above the EPA interim screening level.

The Department of Labor Occupational Safety and Health Administration (OSHA) issued \$110,200 in proposed penalties to the facility in January 2015 based on inspections made in 2014. Violations were related to the upkeep, use, and provision of required safety equipment and training for employees in addition to proper storage and disposal of chemicals. Specific violations of note included storing sodium hydroxide together with sulfuric acid and exposing employees to hexavalent chromium. Violations documented hexavalent chromium on surfaces inside the facility building. A second NOE letter was transmitted to the facility in March 2015.

TCEQ conducted an investigation in November 2015 to determine if conditions posed an immediate threat to nearby residents and if grinding grit had spread off of the facility property. Grinding grit was observed on the ground surface south and southeast of the HWTB. Leaks, openings in the walls, and yellow stains believed to be chromium were observed in the facility building. Yellow stains were additionally observed on the west side of the facility building on the exterior southeast corner. Soil samples were collected from the southern boundary of the

property at a depth of 0-3 inches (in.) below ground surface (bgs). Antimony, arsenic, cadmium, chromium, and mercury were detected above SCDM soil exposure pathway benchmarks, and lead was detected above the screening level.

TCEQ conducted a limited removal action in November and December 2015. The scope of work included hazard characterization analysis/chemical characterization of chemicals in the facility lab, lab pack and re-packaging of select chemicals, the removal of chromic acid sludge from two sumps at the facility, and securing the chromic acid waste into poly totes. All outside doors to the facility building were secured and locked, and metal cattle panels were used to secure the first floor windows. As State enforcement was exhausted, TCEQ referred the site to the EPA Region 6 Superfund Program for further evaluation.

Representatives from the TCEQ and EPA Superfund Removals program conducted a facility visit in February 2016 and observed incompatible wastes stored together, staining, visibly impacted soils, wastes appearing to seep underneath the facility foundation, and large volumes of hazardous wastes. Grab samples collected by TCEQ from the two shallow facility water wells in February 2016 contained concentrations of chromium and hexavalent chromium above SCDM ~~ground water~~ groundwater pathway benchmarks and the Maximum Contaminant Level (MCL).

In March 2016, the EPA Emergency Management Branch tasked an EPA Region 6 Superfund Technical Assessment Response Team contractor to perform a Removal Assessment (RA) at the site, which is documented in the Removal Report (Weston 2016) completed for the site. A two-phase remedial action was conducted at the site in April and September 2016 (EPA 2018a). Excessive chromium staining on the floor and small pools of plating wastes from ongoing releases were observed in the facility building, in addition to chromium staining on the outside of the building from past spills and releases.

Based on information ~~provided by EPA~~ adapted from the EPA 2018 SOW (EPA 2018c), during the April 2016 remedial action field event, composite five-point soil sampling was conducted within thirty-seven 50 ft. by 50 ft. grids along the exterior of the facility. Within each grid, sample aliquots were collected from each corner and from the center of the grid at a depth of 0 to 6 in. bgs. The aliquots were then combined and containerized as a composite sample. Five biased grab soil samples were collected by the EPA Team in areas previously identified by TCEQ to have elevated concentrations of lead and chromium along the southeastern part of the site. A total of 36 soil samples and 4 liquid waste samples were collected to determine the nature and extent of site related, hazardous constituents associated with electroplating waste (plating waste) in onsite soils. Liquid waste samples were used to verify if liquids, contained in an unknown number of drums and totes, were considered hazardous substances. Soil samples were submitted for analysis of metals and hexavalent chromium. Soil analytical data was compared to the May 2016 Regional Screening Levels (RSLs), Industrial Soil (Target Hazard Quotients = 1.0). The liquid waste characterization results were compared to 40 CFR Part 261. Based on the analytical results, hexavalent chromium, lead, and mercury contaminated soil was present around the footprint of the building. Hexavalent chromium was reported in 17 grids exceeding the EPA RSL of 6.3 milligrams per kilogram (mg/kg). Hexavalent chromium contaminated soil ranged in concentration from 167 mg/kg (Grid E7) to 5,620 mg/kg (Grid G7). Lead exceeded the EPA

RSL of 800 mg/kg in six grids. Mercury was observed above instrument detection limits in several grids but only exceeded in one grid above the EPA RSL of 46 mg/kg.

During the September 2016 remedial action field event, composite five point soil samples were collected from within approximately 72 grids. Samples were collected at three depth intervals: 0 to 6 in. bgs, 6 to 12 in. bgs, and 12 to 18 in. bgs. Soil samples were submitted for analysis of metals and hexavalent chromium. A total 216 samples (192 normal, 20 duplicate, and 4 equipment) were collected during this sampling event. Samples collected at the 6 to 12 in. interval were placed on hold pending analytical results from the 0 to 6 in. and 12 to 18 in. intervals. Based on the analytical results, hexavalent chromium, lead, and mercury contaminated soil was present around the footprint of the building. Hexavalent chromium was reported in three grids exceeding the May 2016 EPA RSL of 6.3 mg/kg. Hexavalent chromium contaminated soil ranged in concentration from 9.69 mg/kg (Grid H4 at a depth of 18 in.) to 203 mg/kg (Grid E6 at a depth of 6 in.). Lead exceeded the EPA RSL of 800 mg/kg in one grid at a concentration of 3740 mg/kg (E6 at a depth of 6 in.). Mercury was reported in two grids exceeding the EPA RSL of 46 mg/kg, ranging from 46.2 mg/kg (I10 at a depth of 6 in.) to 77.8 mg/kg (E6 at a depth of 6 in.).

Based on information adapted from the 2018 HRS Documentation Record (EPA 2018a), samples of chromic acid waste collected during the 2016 remedial action field events were confirmed to be hazardous. Hazardous characterization identification of waste containers was performed, and remaining vats and sumps were pumped and transferred into compatible containers. Waste containers were transported from the facility to authorized facilities for final disposal in November 2016. The following waste streams were identified: cyanide solution and solids, chromic acid and chromic acid sludges/solids, sulfuric acid, flammable aerosol and liquids, acid solids and liquids, neutral solids and liquids, elemental mercury, caustic solids and liquids, and soil. *In situ* contaminated soils currently remain in place and will be investigated further as part of this RI.

In July 2016, TCEQ also performed a site inspection sampling event to evaluate the surface water pathway (TCEQ 2017). Antimony, cadmium, chromium, copper, lead, mercury, nickel, and zinc were detected at elevated concentrations in soil along the overland segments at depths up to 6 to 8 in. bgs. Of these, arsenic, cadmium, chromium, and mercury were detected above SCDM soil exposure pathway benchmarks, and lead was detected above the screening level in soil. Chromium, cyanide, lead, and mercury in sediment at depths of 0-6 or 6-12 in. bgs, and aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc in surface water were detected at elevated concentrations in the surface water pathway. Of these, aluminum, copper, iron, lead, and zinc were detected above SCDM surface water pathway environmental benchmarks (chronic, fresh criteria continuous concentration).

In January 2018 the HRS Documentation Record was prepared for the site, and in May 2018 the site was placed on the National Priority List.

#### 1.1.4 Site Description

Site description information has been adapted from the 2018 HRS Documentation Record (EPA 2018a), the 2018 National Priority List (EPA 2018b), ~~2018 EPA SQW (EPA 2018c)~~, and the May 2016 Preliminary Assessment (PA) Report, which was Prepared by TCEQ in cooperation with EPA Region 6 (TCEQ 2016).

#### 1.1.4.1 Physical Site Characterization

The site, as scored in the 2018 HRS Documentation Record (EPA 2018a), consists of four sources and releases of chromium, copper, cyanide, lead, manganese, mercury, nickel, and zinc to the surface water migration pathway. The identified sources include: (1) contaminated soil currently located underneath and surrounding the facility building, (2) underground sumps located inside the facility building, (3) wastes containerized in tanks and other containers, and (4) wastes containerized in drums. The identified targets in the 2018 HRS Documentation Record included fisheries, wetlands, and sensitive environments located within the target distance limit.

Fisheries are located in the Joppa Preserve/Lemmon Lake Park and Trinity River. Habitat known to be used by the state-designated endangered or threatened wood stork and white-faced ibis are located in the Joppa Preserve/Lemmon Lake Park. Freshwater forested/shrub wetlands are located in the site vicinity, Joppa Preserve/Lemmon Lake Park, and along the Trinity River.

The primary receptors near the site consist of the small streams and associated wetlands, making surface water a suspected pathway. An unnamed stream, referred to as Stream 5A2, is located approximately 450 ft. east of the facility and flows south into a small pond located southeast of the facility. Site and area topography slope gently to the south and southeast (Figure 3). Surface water runoff follows two primary overland segments: (1) east along the north side of the facility building and then due south for approximately 500 ft. before reaching a wetland, and (2) southeast of the facility across a field for approximately 400 ft. before reaching a small pond and Stream 5A2 (Figure 3). Stream 5A2 flows south from the small pond for approximately 300 ft. before joining another unnamed stream (Figure 3). The merged stream flows east and eventually discharges into the Trinity River.

Cyanide, lead, mercury, chromium, and hexavalent chromium have been identified as contaminants of potential concern (COPCs) impacting onsite soils, underlying ~~ground-water~~ groundwater, and sediments downstream from the site. Contaminant levels in onsite soils exceed the EPA RSLs for residential and industrial use (EPA 2018b). The list of COPCs will be refined as the investigation progresses, which may result in identification of additional COPCs.

#### 1.1.4.2 Geologic Setting

The site is underlain by Quaternary alluvium and Pleistocene fluvial terrace deposits. The Quaternary alluvium is comprised of flood plain deposits of gravel, sand, silt, silty clay, and organic matter. Fluvial terrace deposits consist of gravel, sand, silt, and clay in contiguous terraces. These deposits range in thickness from approximately 0 to 75 ft. bgs. The Quaternary sediments are underlain by the Cretaceous-age Austin Chalk. The upper and lower parts of the Austin Chalk consist of mostly massive microgranular calcite and some interbeds and partings of

calcareous clay, with thin bentonitic beds locally in the lower part. The middle part of the Austin Chalk is mostly thin-bedded marl with interbeds of massive chalk. The Austin Chalk has a thickness of approximately 300 to 500 ft. (TCEQ 2016).

Underlying the Austin Chalk is the Eagle Ford Group of Cretaceous age, which is 200 to 300 ft. thick and comprised predominantly of shale with thin beds of limestone and bentonite. The Cretaceous-age Woodbine Formation underlies the Eagle Ford Group. This formation is approximately 175 to 250 ft. thick and composed mostly of sandstone. The Woodbine is underlain by the Cretaceous-age Washita and Fredericksburg Groups, which consist primarily of limestone, dolomite, marl, and shale. The Fredericksburg and Washita Groups have a combined thickness of approximately 1,250 ft. and separate the Woodbine from the underlying Paluxy Formation of the Trinity Group. The Paluxy Formation is the upper member of the Trinity Group, approximately 400 ft. thick, and is comprised mostly of sand/sandstone and some shale and limestone. The Glen Rose Formation divides the two Trinity Group aquifer formations in the area and consists of limestone, marl, shale, and anhydrite. It can reach thicknesses of up to 1,500 ft. The Twin Mountains Formation, originally named the Travis Peak Formation, consists of sand, silty clay, and siliceous conglomerates of chert, quartzite, and quartz pebbles and has a thickness of up to 1,000 ft. (TCEQ 2016).

#### 1.1.4.3 Aquifer System

The site overlies the Quaternary alluvium and Pleistocene fluvial terrace deposits and the Austin Chalk. The Quaternary alluvium and Pleistocene fluvial terrace deposits are generally irregular in thickness and extent in close proximity to the site, as well as along Five Mile Creek and the Trinity River to the east of the site. Several nearby ~~ground-water~~groundwater monitoring wells are installed to the northwest, northeast, and east of the site to an average depth of 40 ft. bgs. These monitoring wells are completed in the unconfined alluvium and terrace deposits, with static water levels around 10 ft. bgs. ~~Ground-water~~Groundwater gradient information is not available for the shallow aquifer. Hydraulic conductivity is low in the Austin Chalk, which is very limited as an aquifer. The Woodbine Aquifer and Twin Mountains Formation of the Trinity Aquifer are also present below the site based on area well drilling logs (TCEQ 2016).

Underlying the Austin Chalk is the Eagle Ford Group. The 200 to 300 ft. thick Eagle Ford Group unconformably overlies the Woodbine Aquifer and acts as a confining unit. The Woodbine Aquifer is categorized by the Texas Water Development Board as a minor aquifer consisting of sandstone interbedded with shale and clay that form three distinct water-bearing zones. The Woodbine Aquifer occurs from approximately 700 to 1,100 ft. bgs and reaches 600 to 700 ft. in thickness in subsurface areas, with freshwater saturated thickness averages of about 160 ft. Based on area well drilling logs, water levels in the Woodbine Aquifer in the vicinity of the site range from 100 to 230 ft. bgs, with total depths of approximately 853 to 1,100 ft. bgs. ~~Ground-water~~Groundwater gradient in the Woodbine Aquifer is generally to the east-southeast (TCEQ 2016).

The Washita Group underlies the Woodbine and overlies the Fredericksburg Group. The two groups are generally considered a confining unit above the Trinity Aquifer and yield only small amounts of water. The two water-bearing formations of the Trinity Group in the vicinity of the

site are the Paluxy and Twin Mountains Formations, separated by the Glen Rose Formation. The Glen Rose Formation only yields small amounts of water to localized areas (TCEQ 2016).

The top of the Paluxy Formation occurs from approximately 1,700 to 2,000 ft. bgs, with a maximum thickness of approximately 400 ft. The Paluxy Formation yields small to moderate quantities of fresh to slightly saline water to municipal, industrial, domestic, and livestock wells. The Twin Mountains Formation has a maximum thickness of up to 1,000 ft., and the top of the formation occurs from approximately 2,300 to 2,800 ft. bgs. It is the primary Cretaceous-age water-bearing formation in the region and yields moderate to large quantities of fresh to slightly saline water to municipal and industrial wells. ~~Ground-water~~Groundwater gradient in both aquifers is generally to the east. The Trinity is the largest and most prolific aquifer in the region; however, the aquifer has been overdeveloped, resulting in significant water level declines across the region (TCEQ 2016).

The unconfined alluvium, Woodbine Aquifer, and Paluxy Formation of the Trinity Aquifer are unlikely to have interconnectivity in this area as the three aquifers are separated from one another by confining units of the Eagle Ford and Washita/Fredericksburg Groups, as discussed earlier in this section. Interconnectivity between the Paluxy and Twin Mountains Formations of the Trinity Aquifer is also unlikely in the vicinity of the site as they are separated by the Glen Rose Formation, which yields small amounts of water. Additionally, the upper part of the Twin Mountains Formation is mostly claystone, and few wells are developed in the upper part of the formation. The Glen Rose Formation pinches out towards the north and is absent in northern Texas counties where the Paluxy and Twin Mountains Formations coalesce into the Antlers Formation (TCEQ 2016).

The Trinity Aquifer supplies wells for public supply, industrial, irrigation, domestic, and livestock use. Irrigation use constitutes a small portion of overall pumpage in the Paluxy and Twin Mountains Formations and is generally limited to irrigation of golf courses and lawns. Irrigation of crops from the Twin Mountains Formation is confined to the outcrop areas located in Hood, Parker, and Wise Counties. Approximately 55 percent of total ~~ground-water~~groundwater use in the Twin Mountains Formation is for municipal and industrial purposes. Municipal and domestic use of the Paluxy Formation accounted for approximately 50 and 24 percent of total ~~ground-water~~groundwater pumpage, respectively. There is no evidence at this time that ~~ground-water~~groundwater is used for irrigation of food or forage crops of five or more acres, for commercial livestock watering, as an ingredient in commercial food preparation, for commercial aquaculture, or for major or designated recreation in close proximity to the site (TCEQ 2016).

Based on information provided in the PA (TCEQ 2016), one domestic well, three PWS wells, two stock wells, eight irrigation wells, and seven industrial wells lie within four miles of the site. The only well located within a mile of the site is an irrigation well. Additional irrigation wells are located within two miles to the northeast and southwest (three wells), within three miles to the east and west (three wells), and within four miles northeast. The nearest PWS wells are located within two, three, and four miles west and southwest of the site and are screened in the Woodbine Aquifer. The closest domestic well is located within three miles east of the site, and



two stock wells are located within three and four miles east of the site, all screened within shallow alluvium. Industrial wells are situated within two miles east-northeast (two wells) and four miles north (five wells) of the site. Irrigation and industrial wells are reportedly screened in the shallow alluvium and Woodbine Aquifer.

Water analytical results were not available for the domestic and PWS wells identified in the search. The TCEQ Texas Drinking Water Watch (TXDWW) website lists one of the PWS facilities (Community Water Service Grand Prairie) as buying their water from the City of Grand Prairie, who buys from the Cities of Fort Worth and Midlothian and the Dallas Water Utility. These are all surface water sources of drinking water located west or north of the site. The other PWS facilities are not listed on the TXDWW website. Installation dates of the domestic and PWS wells are old, ranging from the 1940s to the 1970s, and it is unknown if these wells are still in use (TCEQ 2016).

There are two onsite shallow wells of unknown historical use located adjacent north of the facility building (Figure 3). These onsite wells were sampled in February 2016 for metals. WW-1 displayed chromium and hexavalent chromium concentrations that exceeded the MCL and SCDM for these metals, and WW-2 displayed a hexavalent chromium concentration that exceeded the SCDM for this metal. The site is not located within a wellhead protection area (TCEQ 2016).

#### 1.1.4.4 Source of Contamination

The 2018 HRS Documentation Record (EPA 2018a) identifies four sources and releases of chromium, copper, cyanide, lead, manganese, mercury, nickel, and zinc to the surface water migration pathway. The identified sources include: (1) contaminated soil currently located underneath and surrounding the facility building, (2) underground sumps located inside the facility building, (3) wastes containerized in tanks and other containers, and (4) wastes containerized in drums. The identified targets in the 2018 HRS Documentation Record (EPA 2018a) included fisheries, wetlands, and sensitive environments located within the target distance limit. Fisheries are located in the Joppa Preserve/Lemmon Lake Park and Trinity River. Habitat known to be used by the state-designated endangered or threatened wood stork and white-faced ibis are located in the Joppa Preserve/Lemmon Lake Park. Freshwater forested/shrub wetlands are located in the site vicinity, Joppa Preserve/Lemmon Lake Park, and along the Trinity River.

#### 1.1.4.5 Nature and Extent of Contamination

The purpose of the RI will be to determine the nature and extent of COPCs that have been previously identified at the site. Cyanide, lead, mercury, chromium, and hexavalent chromium have been identified as COPCs impacting onsite soils, underlying ~~ground-water~~ groundwater, and sediments downstream from the site (EPA 2018b). This is supported by:

- The 2016 remedial action data, which indicates that hexavalent chromium, lead, and mercury contaminated soil is present around the footprint of the building (EPA 2018a).

- \* Two old, unused water wells are located on the north side of the facility building. Grab samples collected by TCEQ from the two shallow wells in February 2016 contained concentrations of chromium and hexavalent chromium above SCDM ground water/groundwater pathway benchmarks and the MCL (EPA 2018a).

- Observed releases of chromium, copper, cyanide, lead, manganese, mercury, nickel, and zinc detected in prior sediment or surface water samples collected from Stream 5A2, the associated small pond, or the merged segment of the unnamed stream and Stream 5A2 (EPA 2018a).

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## 1.2 DESCRIPTION OF PROJECT OBJECTIVES AND TASKS

This section describes the project objectives and tasks for this SAP.

### 1.2.1 Project Objectives

The primary objective is to conduct a RI at the site leading to the investigation and study of subsurface onsite and offsite soils, surface water, sediment, shallow ground water/groundwater, and possibly soil gas, indoor air, and biota samples. The goal is to develop an adequate amount of data necessary to support the selection of an approach for site remediation and then to use this data to result in a well-supported Feasibility Study (FS) and ROD. The sampling activities associated with the RI will be conducted in an iterative, phased approach which is discussed further in Section 1.2.3.

### 1.2.2 Project Tasks

To complete RI activities, EA will perform the following active tasks (with subtasks); which are outlined in the approved Work Plan (EA-2018a):

- Project Planning and Support
- Community Involvement (Inactive)
- Field Investigation/Data Acquisition
- Sample Analysis
- Analytical Support and Data Validation
- Data Evaluation
- Risk Assessment (Inactive)
- RI Report (Inactive)
- Remedial Alternatives Screening (Inactive)
- Remedial Alternatives Evaluation (Inactive)
- FS Report (Inactive)
- Post-RI/FS Support (Inactive)

- Administrative Record (Inactive)
- Task Order Closeout.

As necessary, the inactive tasks identified above may be activated in the future through Task Order Modifications.

### 1.2.3 Project Sampling Approach

Available laboratory data have been generated from the site in several previous sampling events dating back to November 2015. The most recent data consist of shallow soil analytical results collected during the 2016 remedial action sampling events (Weston 2016); and soil, sediment and surface water data collected and presented in the TCEQ site inspection (TCEQ 2017). Data collected in November 2015 and presented in the TCEQ PA (TCEQ 2016) was not carried forward for further evaluation under the RI due to uncertainties associated with data validation, and because no coordinates were available for sample locations.

The current data is not complete enough or of sufficient quality to develop a firm conceptual understanding of the site, and a complete sampling program is necessary to complete the RI. The overall project goals will be achieved using an iterative, phased sampling approach. The goals of each phase and primary activities that will be performed during the phase will be included in a Sampling Design Matrix (Appendix A). As necessary, the Sampling Design Matrix may be amended with an addendum, to incorporate subsequent phases and sampling events for the RI.

This SAP presents the standard procedures for conducting each of the tasks anticipated to be needed to complete the RI. To meet the project objective, EA's tasks include the collection of samples. EA's field activities will be conducted in accordance with this SAP to ensure the proper management of samples, including accurate chain-of-custody (COC) procedures for sample tracking, protective sample-packing techniques, and proper sample-preservation techniques. The requirements of EA's site-specific HASP (EA 2018b) will be followed. Sample management activities will be conducted using the EPA-proprietary Scribe software. EA will document the characterization and disposal of investigation-derived waste (IDW) in accordance with local, state, and federal regulations, as appropriate.

## 1.3 DATA AND MEASUREMENT QUALITY OBJECTIVES

The following subsections present the DQOs and measurement quality objectives identified for this project.

### 1.3.1 Data Quality Objectives

DQOs are qualitative and quantitative statements developed through the seven-step DQO process



**STEP 3: Identify Information Inputs**

- During each phase, environmental, geologic, and hydrogeologic information (e.g., soil borings, soil samples, ~~ground-water~~groundwater samples, surface water samples, ~~ground-water~~groundwater and surface water elevations, etc.) will be collected; multi-media samples will be analyzed by laboratories to determine the nature and level of contamination present such that ~~risk to human and ecological receptors can be assessed~~risks to human health and the environment can be assessed.
  - If VOCs are identified for the site, soil vapor sampling to include ASG, PSG, and/or indoor air data may be warranted during future RI phases to locate source areas and guide soil and indoor air sampling. PSG may also be used as a screening tool to delineate ~~ground-water~~groundwater contamination and guide placement of future monitoring wells.
  - ~~As warranted, future RI phases may also include the collection of biota samples from nearby creeks based on the results of surface water and sediment data.~~
  - Aquifer parameters may be collected during future ground-watergroundwater pumping tests that can be used as input parameters to support contaminant fate and transport modeling and possibly ground-watergroundwater capture modeling.
- 
- ~~As warranted, future RI phases may also include the collection of biota samples from nearby creeks based on the results of surface water and sediment data.~~
  - Aquifer parameters may be collected during future groundwater pumping tests that can be used as input parameters to support contaminant fate and transport modeling and possibly groundwater capture modeling.

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<b>STEP 4: Define the Boundaries of the Study</b>
<ul style="list-style-type: none"> <li>The <del>ground-water</del>groundwater plume and boundaries of other impacted media are not well established and appear to extend beyond the property boundary.</li> <li>The vertical boundary is to be determined; depth to <del>ground-water</del>groundwater in wells with known contamination is encountered at approximately 10 ft. bgs. The vertical boundary is currently assumed to be limited to the alluvial <del>ground-water</del>groundwater unit beneath the site.</li> </ul>
<b>STEP 5: Develop the Analytic Approach</b>
<ul style="list-style-type: none"> <li>If <del>ground-water</del>groundwater is contaminated and confirmed to be above screening levels provided in Tables D-2A and D-2B (Appendix D), collect sufficient data to determine nature and extent, and in the future perform a risk assessment to determine if the contamination poses an unacceptable risk. Select the most appropriate remedy for risk mitigation during the subsequent FS.</li> <li>If VOCs are identified at the site, and future RI sampling phases confirms vapors are present in shallow soil as indicated by active soil gas mass in the samplers, or if vapors have impacted air quality inside of commercial properties and residences at a level that poses a human health risk, determine the source of the vapors and implement means of mitigating the intrusion in the future. During the FS, determine the most appropriate actions to be taken for risk mitigation.</li> <li>If contamination in soil at a specific source area is confirmed to be above screening levels provided in Tables D-1A and D-1B (Appendix D), collect sufficient data to determine nature and extent and in the future perform a risk assessment to determine if the contamination poses an unacceptable risk. If it does pose a risk or the possibility of a continuing release to <del>ground-water</del>groundwater and/or surface water, determine the most appropriate actions to be taken for risk mitigation during the FS.</li> <li>If contamination in <del>sediment and surface water</del> and sediment is above screening levels provided in Tables D-3A, D-3B, D-4A, and D-4B (Appendix D), respectively, collect sufficient data to determine nature and extent, make determination as to whether or not biota samples are required, and in the future perform a risk assessment to determine if the contamination poses an unacceptable risk. If they do pose a risk, determine the most appropriate actions to be taken for risk mitigation during the FS.</li> <li>Some of these decision rules may not be satisfied until data collection is completed during the last RI phase.</li> </ul>
<b>STEP 6: Specify Performance or Acceptance Criteria</b>
<ul style="list-style-type: none"> <li>Sample collection procedures, sample processing, and field sample analysis protocols are standardized and documented in SOPs to ensure that the methodology remains consistent and limits the potential for measurement error.</li> <li>Field teams will be trained and perform specific tasks (e.g., sample collection or processing) throughout the field sampling effort to limit the potential for measurement error.</li> <li>Potential for measurement error in the sample analysis will be limited by the analysis of QC samples (e.g., duplicates) and the implementation of strict analytical laboratory SOPs.</li> <li>Data management procedures and sample tracking software (i.e., Scribe) will limit the potential for data reduction, transmission, and storage errors.</li> </ul>

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STEP 7: Develop the Plan for Obtaining Data
<ul style="list-style-type: none"> <li>Initially, low-flow <del>ground-water</del> <del>groundwater</del> sampling will be used to sample existing on-site wells and monitoring wells installed during the Phase 1 RI field event.</li> <li>Subsequent sampling will be conducted based on data collected during the Phase 1 sampling activities.</li> <li>Field generated waste water and soil cuttings will be containerized, sampled and disposed appropriately.</li> <li><del>Ground water</del> <del>Groundwater</del> samples will be collected from the existing on-site wells and Phase 1 monitoring wells. Based on the results of sampling and historical sampling results, additional monitoring wells will be installed and <del>ground-water</del> <del>groundwater</del> samples collected to complete horizontal and vertical <del>ground water</del> <del>groundwater</del> delineation. <del>Ground water</del> <del>Groundwater</del> gauging will also be performed in conjunction with <del>ground-water</del> <del>groundwater</del> sampling across the network at the site to support environmental fate and transport modeling, as required in the future.</li> <li>If it is determined that VOCs are present during the Phase I sampling event, PSG, ASG, and/or indoor air samples may be collected to delineate soil gas impacts and determine if further vapor intrusion evaluation is needed. The samples will also help determine contaminant source locations and provide basis for soil boring locations, and new monitoring well locations.</li> <li>Soil borings and soil samples will be collected during Phase 1 to delineate soil contamination and confirm source areas <del>and lithology</del>. If needed, additional soil samples may be collected during future RI phases in order to further determine the nature and extent of soil contamination.</li> <li>Surface water and sediment samples will be collected to determine impact to drainage systems located south and east of the site. Based on the results of the surface water and sediment samples, biota samples may also be collected and analyzed during future RI phases.</li> <li>Geotechnical/permeability soil samples and pump tests may be performed in the future to support environmental fate and transport modeling.</li> </ul>
<p>NOTES:</p> <p>ASG = Active soil gas.  bgs = below ground surface.  CLP = Contract Laboratory Program.  PSG = Passive soil gas.  QC = Quality control.  RI = Remedial Investigation.  SOP = Standard operating procedure.</p>

### 1.3.2 Measurement Quality Objectives

Analytical results will be evaluated in accordance with PARCCS parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project objectives. Of these PARCCS parameters, precision and accuracy will be evaluated quantitatively with analytical results from the QC samples listed in Table 3. The subsections below describe each of the PARCCS parameters and how they will be assessed in support of this project.

**Table 3. Data Quality Indicators for Laboratory Data Obtained from Analysis of Investigation Samples**

SEQ CHAPTER or Indicator Parameter	Analytical Parameter	QC Sample	Acceptance Criteria for Laboratory Analysis
Accuracy (percent recovery)	VOCs, SVOCs, PCBs, TPH, PFCs,	LCS, LCSD MS, MSD Blanks <sup>(a)</sup>	70-130 percent recovery 50-150 percent recovery  Less than CRQL
	Total Analyte List (TAL) Metals, Hexavalent Chromium, Cyanide	LCS, LCSD MS, MSD Blanks <sup>(a)</sup>	80-120 percent recovery 75-125 percent recovery Less than CRQL
Precision (RPD)	VOCs, SVOCs, PCBs, TPH, PFCs <u>TPH, PFCs</u>	<u>MS/MSD</u> <u>LCS/LCSD</u> <u>SD</u> <u>LCS/LCSD</u> <u>MS</u> , <u>MSD</u> Field duplicates	30 percent RPD (MS/MSD)  <u>30 percent RPD (LCS/LCSD)</u> 50 percent RPD (Field Duplicates)
	TAL Metals, Hexavalent Chromium, Cyanide	MS, MSD, MD,  Field duplicates	20 percent RPD (aqueous) 35 percent RPD (solid) 50 percent RPD
Sensitivity (quantitation limits)	All analytical tests	MS, MSD Field duplicates	Not applicable
Completeness	The objective for data completeness is 90 percent.		
Representativeness	The sampling network analytical methods for this site are designed to provide data that are representative of site conditions.		
Comparability	The use of standard published sampling and analytical methods, and the use of quality control samples, will ensure data of known quality. These data can be compared to any other data of known quality.		

NOTES:  
(a) May include method blanks, reagent blanks, instrument blanks, calibration blanks, trip blanks and field blanks.  
CRQL = Contract required quantitation limit.  
LCS = Laboratory control sample.  
LCSD = Laboratory control sample duplicate.  
MD = Matrix duplicate  
MS = Matrix spike.  
MSD = Matrix spike duplicate.  
PCB = Polychlorinated biphenyl.  
PFC = Perfluorinated ~~compound~~chemical.  
RCRA = Resource Conservation and Recovery Act.  
RPD = Relative percent difference.  
SVOC = Semi-volatile organic compound.  
TPH = Total petroleum hydrocarbon.  
VOC = Volatile organic compound.

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### 1.3.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Combined field and laboratory precision is evaluated by

collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

RPD is calculated as follows:

[ EMBED Equation.3 ]

where

A = Parent concentration.

B = Duplicate concentration.

For every 10 samples collected, one field duplicate sample will be collected.

Laboratory analytical precision is evaluated by analyzing laboratory QC sample duplicates (also called matrix spike [MS] and matrix spike duplicates [MSD]). For this project, MS/MSD samples will be generated for all organic analytes, and MS/matrix duplicates (MD) samples will be generated for inorganic analytes. Laboratory control samples (LCS) and LCS duplicates (LCSD) may also be generated for total petroleum hydrocarbon (TPH) and perfluorinated compound (PFC) analysis to assess analytical method precision. The results of the analysis for each MS/MSD and LCS/LCSD pair will be used to calculate the RPD as a measure of laboratory and analytical method precision for organic compounds.

Laboratory analytical precision is evaluated by analyzing laboratory duplicates (also called matrix spike [MS] and matrix spike duplicates [MSD]). For this project, MS/MSD samples will be generated for all organic analytes. The results of the analysis for each MS/MSD pair will be used to calculate the RPD as a measure of laboratory precision for organic compounds.

### 1.3.2.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control sample (LCS) and LCSD, or blank spikes, surrogate standards, and method blanks. MS and MSD samples will be collected at a frequency of five percent and will be prepared and analyzed with each analytical batch or at a frequency of one pair per 20 samples analyzed five percent. LCS, LCSD or blank spikes are also analyzed at a frequency of one pair five percent per analytical batch. Surrogate standards, where applicable, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy relative to laboratory-specific measurement criteria. A program of sample spiking will be conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control sample (LCS) or blank spikes, surrogate standards, and method blanks. MS and MSD samples will be prepared and analyzed at a frequency of 5 percent. LCS or blank spikes are also analyzed at a frequency of 5 percent. Surrogate standards, where applicable, are

added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy relative to laboratory specific measurement criteria.

[ EMBED Equation.3 ]

where

- S = Measured spike sample concentration
- C = Sample concentration
- T = True or actual concentration of the spike.

The objective for accuracy of field measurements is to achieve and maintain factory specifications for the field equipment. Field-portable analyzers will be calibrated using calibration standards at the start of each field day. Field instruments will be calibrated each day following manufacturer recommendations prior to daily use (see Section 2.8). If calibration reading deviate 20 percent or more from the concentration of the calibration standard, the unit will be recalibrated.

#### 1.3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition that they are intended to represent. For this project, representative data will be obtained through careful selection of sampling locations, the selection of appropriate areas and depths for placing additional monitoring wells, and analytical parameters. Representative data will also be obtained through proper collection and handling of samples to avoid interference and minimize contamination.

Representativeness of data will also be ensured through the consistent application of established field and laboratory procedures. Trip and field blanks and laboratory blank samples will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined, by comparison with existing data, to be non-representative will be used only if accompanied by appropriate qualifiers and limits of uncertainty.

#### 1.3.2.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability are exceeded.

When all data validation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation. The completeness goal is 90 percent.

Completeness will also be evaluated as part of the data quality assessment (DQA) process to be performed by EPA upon receipt of data (EPA 2006a, 2017a, 2017b). This evaluation will help determine whether any limitations are associated with the decisions to be made based on the data collected.

#### 1.3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data. Standard EPA analytical methods and QC will be used to support the comparability of analytical results with those obtained in other testing. Calibrations will be performed in accordance with EPA or manufacturer's specifications and will be checked with the frequency specified in the EPA analytical method.

#### 1.3.2.6 Sensitivity (Detection and Quantitation Limits)

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix.

CRQLs are contractually specified maximum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. CRQLs, which are established by EPA in the scope of work for subcontract laboratories (EPA 2016a, 2016b), are set to establish minimum criteria for laboratory performance; actual laboratory quantitation limits may be substantially lower.

For this project, CLP analytical methods or equivalent have been selected for ~~ground water~~groundwater samples in an attempt to have CRQLs for each target analyte below the action levels, if possible. For this project, sample results will be reported as estimated values if concentrations are less than CRQLs but greater than MDLs. The MDL for each analyte will be listed as the detection limit in the laboratory's hardcopy data report and electronic data deliverable (EDD).

### 1.4 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATION

This section outlines the training and certification required to complete the activities described in this SAP. The following sections describe the requirements for the EA team and subcontractor personnel working onsite.

#### 1.4.1 Safety and Health Training

EA field team personnel who work at hazardous waste project sites are required to meet the OSHA training requirements defined in 29 CFR 1910.120(e). These requirements include: (1) 40 hours of formal offsite instruction, (2) a minimum of ~~three~~ days of actual onsite field experience under the supervision of a trained and experienced field supervisor, and (3) ~~eight~~ hours of annual refresher training. Field personnel who directly supervise employees engaged in hazardous waste operations also receive at least ~~eight~~ additional hours of specialized supervisor training. At least one member of the field team will maintain current certification in first aid and cardiopulmonary resuscitation.

Copies of the field team's safety and health training records, including course completion certifications for the initial and refresher safety and health training, specialized supervisor training, and first aid and cardiopulmonary resuscitation training, are maintained in project files.

Before work begins at a specific hazardous waste project site, EA personnel are required to undergo site-specific training that thoroughly covers the following areas:

- Names of personnel and alternates responsible for safety and health at a hazardous waste project site
- Health and safety hazards present onsite
- Selection of the appropriate personal protective equipment (PPE)
- Correct use of PPE
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment onsite
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazardous substances.

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For this project, Level D PPE will be used. For more safety and health details, see EA's site-specific HASP (EA 2018b).

#### 1.4.2 Subcontractor Training

Subcontractors who work onsite will certify that their employees have been trained for work on hazardous waste project sites. Training will meet OSHA requirements defined in 29 CFR 1910.120(e). Before work begins at the project site, subcontractors will submit copies of the training certification for each employee to be working onsite to EA.

Employees of associate and professional services firms and technical services subcontractors will attend a daily safety briefing and complete the Safety Meeting Sign-Off Sheet before they conduct onsite work. This briefing is conducted by the EA Health and Safety Officer or other qualified person.

Subcontractors are responsible for conducting their own safety briefings. EA personnel may audit these briefings. Alternatively, the subcontractors may elect to attend the EA safety briefings.

## 1.5 DOCUMENTATION AND RECORDS

The following sections discuss the requirements for documenting field activities and preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

### 1.5.1 Field Documentation

Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities and will follow SOP No. 059 (Appendix C). The logbook will list the contract name and number, site name, and names of subcontractors, service client, and EA Project Manager. At a minimum, the following information will be recorded in the field logbook:

- Name and affiliation of all onsite personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolution
- Discussions of deviations from the SAP or other governing documents
- Description of all photographs taken.

Corrections in the field logbook will consist of line-out deletions that are initialed and dated as per SOP No. 059 (Appendix C).

### 1.5.2 Laboratory Documentation

This section describes the data reporting requirements for the project laboratories (e.g., EPA CLP laboratories, EPA Regional laboratory, or EA subcontracted laboratories) that generate measurement data under the EPA Region 6 RAC II program.

EA will require fixed offsite non-CLP laboratories to prepare and submit data packages in accordance with the EPA CLP protocols (EPA 2016a, 2016b) for hard copy and EDD format of data. Data packages will include applicable documentation for independent validation of data and verification of the DQOs. The following documentation will be required for data validation, if applicable:

- Case narrative, which will describe QC non-conformances that are encountered during the analysis of samples in addition to any corrective actions that are taken:
  - Statement of samples received
  - Description of any deviations from the specified analytical method
  - Explanations of data qualifiers that are applied to the data
  - Any other significant problems that were encountered during analysis.
- Field and laboratory sample identification cross-reference
- COC forms, which pertain to each sample delivery group or sample batch
- Laboratory reports, which must show traceability to the sample analyzed and must contain specified information:
  - Project identification
  - Field sample number
  - Laboratory sample number
  - Sample matrix description
  - Dates and times of sample collection, laboratory receipt, preparation, and analysis
  - Description of analytical method and reference citation
  - Results of individual parameters, with concentration units, including second column results, second detector results, and other confirmatory results, where appropriate
  - Quantitation limits achieved
  - Dilution or concentration factors.
- Data summary forms and QC summary forms showing analytical results, if applicable:
  - Samples
  - Surrogates
  - Blanks
  - Field QC samples
  - LCS
  - Initial and continuing calibrations
  - Other QC samples.
- Laboratory control documentation:
  - Raw data
  - Instrument printouts
  - Laboratory bench sheets for preparation of samples.

- MDL study results.

EA's Project Chemist, in cooperation with the QA Officer, will define site-specific requirements for data reporting. Requests for analytical services define these requirements, the turnaround time for receipt of the data deliverables specified, and requirements for retaining samples and laboratory records. Laboratory QA Managers are responsible for ensuring that all laboratory data reporting requirements are in accordance with CLP protocol.

### 1.5.3 Level 4 Type Data Package

A level 4 type data package deliverable is required for the RI analytical laboratory data. The laboratory will prepare data packages in accordance with the instructions provided in the EPA CLP SOWs (EPA 2016a, 2016b). Data packages will contain the information from the summary data package and associated raw data. Data packages are due to EA within 45 days after the last samples in the sample delivery group is received by the laboratory. In the case where an EA-subcontracted laboratory is used, level 4 type data deliverables and EDDs are due to EA within 35 days after the last sample in the sample delivery group is received. Unless otherwise requested, the subcontractor will deliver the final data package and EDD via email or a secure data portal.

### 1.5.4 Reports Generated

Following completion of the RI field program and receipt of validated data, EA will prepare the following reports associated with the Phase 1 RI:

- Data Evaluation Summary Report, which will include reduced and tabulated data, as well as data usability and a data trend evaluation, and figures illustrating the sample locations.

## 2. DATA GENERATION AND ACQUISITION

This section describes the requirements for the following:

- Sampling process design (Section 2.1)
- Mobilization (Section 2.2)
- Sampling methodology (Section 2.3)
- Sampling handling and custody (Section 2.4)
- Analytical methods requirements (Section 2.5)
- Quality control requirements (Section 2.6)
- Instrument and equipment testing, inspection, and maintenance requirements (Section 2.7)
- Instrument calibration and frequency (Section 2.8)
- Requirements for inspection and acceptance of supplies and consumables (Section 2.9)
- Data acquisition requirements (Section 2.10)
- Data management (Section 2.11).

### 2.1 SAMPLING PROCESS DESIGN

The objective of this RI is to obtain an adequate amount of data necessary to support the selection of an approach for site remediation and then to use this data to result in a well-supported FS and ROD. This includes refining the nature and extent of site contaminants using a phased RI approach. To complete this objective EA currently anticipates collecting ~~ground~~ groundwater, soil, surface water, and sediment samples from existing and new locations onsite and offsite during the Phase 1 field event. Samples will be shipped to selected analytical laboratories for analysis as appropriate (CLP, Region 6 or EA-subcontracted). Additionally, IDW water and soils generated from sampling activities will be characterized and disposed appropriately.

As stated previously, the goals of each phase and primary activities that will be performed during Phase 1 will be included in a Sampling Design Matrix (Appendix A). A copy of the proposed schedule for this work is also included in Appendix A. The Sampling Design Matrix will be amended, as necessary, during subsequent phases of the RI field activities. Appendix D contains screening levels and reporting limits for the required analytical methods and parameters.

For the activities associated with this Task Order and SAP, main elements of the sampling design include the numbers and types of samples to be collected, sampling locations, sampling frequencies, and sample matrices. ~~The EA Work Plan (EA-2018a) has established the maximum number of samples that will be collected for each matrix.~~ EA will amend the SAP to incorporate additional Sampling Design Matrixes prior to the start of subsequent phases of the investigation. The Sampling Design Matrix for each phase of the site investigation will be included in an addendum to this SAP.

The overall Phase 1 investigation will include the following elements:



**Ground-Water Sampling**—EA will collect ground-water samples from existing onsite water wells and newly installed ground-water monitoring wells as part of the Phase 1 RI field activities. The ground-water samples will be analyzed for the target analyte list (TAL) metals (total and dissolved), hexavalent chromium, cyanide, and total dissolved solids (TDS). The groundwater samples collected for dissolved metals will be filtered during sample collection. PFC sampling requires special handling to minimize contamination, and the EA Standard Operating Procedure No. 073 found in Appendix C will be followed for this sampling. During the Phase 1 RI sampling activities, a subset of these samples (20 percent) will also be analyzed for the target compound list VOCs, semi-volatile organic compounds (SVOCs), cyanide, polychlorinated biphenyls (PCBs; total and aroclors), perfluorinated chemicals (PFCs), and total petroleum hydrocarbons (TPH). Additional monitoring wells may be installed during future RI phases, and the analyte list may be adjusted based on the results obtained during the Phase 1 RI sampling event. Further information regarding the collection of ground-water samples is provided under Section 2.3.1 of this SAP and in the Sampling Design Matrix (Appendix A).

**Monitoring Well Installation**—EA anticipates installing and developing additional ground-water monitoring wells. These wells will have 2-inch diameter polyvinyl chloride (PVC) casing and will be drilled to a maximum depth of 40 ft. bgs. Hollow-stem auger (HSA) drilling methods will be used to install the wells. During Phase 1, three new monitoring wells are anticipated. Up to three soil samples will be collected from each boring, and samples will be analyzed for TAL metals, and hexavalent chromium, and cyanide. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, cyanide, PCBs (total and aroclors), PFCs, TPH, oxidation – reduction potential (ORP), and pH. A soil core will also be collected from each monitoring well borehole and will be analyzed for geotechnical parameters. Additional monitoring wells may be installed during subsequent phases of the RI, as needed. Further information regarding monitoring well installation is provided under Section 2.3.3 of this SAP and in the Sampling Design Matrix (Appendix A).

**Soil Investigation**—EA anticipates installing soil borings and collecting soil samples to better characterize suspected source areas, and to delineate nature and extent of impacted surface and subsurface soil. Up to three soil samples will be collected from each boring, and samples will be analyzed for TAL metals and hexavalent chromium, and cyanide. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOC, SVOCs, cyanide, PCBs (total and aroclors), PFCs, TPH, ORP, and pH. Additional soil borings may be installed during future RI phases, and the analyte list may be adjusted during on the results obtained during the Phase 1 RI sampling event. Further information regarding the soil investigation is provided under Section 2.3.2 of this SAP in and the Sampling Design Matrix (Appendix A).

***Surface Water and Sediment Sampling***— EA will collect sediment and surface water samples as part of the Phase 1 RI field activities. To the extent possible, surface water samples will be co-located with sediment sample locations. In the event surface water is not present at a sediment location, the surface water sample may be re-located to another area where only a surface water sample will be collected.

The sediment samples will be analyzed for TAL metals, and hexavalent chromium, and cyanide. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, cyanide, PCBs (total and aroclors), PFCs, TPH, ORP, pH, total organic carbon (TOC) and acid volatile sulfide/simultaneously extracted metals (AVS/SEM). Additional sediment samples may be collected during future RI phases the analyte list may be adjusted based on the results obtained during the Phase 1 RI sampling event.

The surface water samples will be analyzed for TAL metals (total and dissolved), and hexavalent chromium, and cyanide. The surface water samples collected for dissolved metals will be filtered during sample collection. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, cyanide, PCBs (total and aroclors), PFCs, TPH, hardness, TDS, total suspended solids (TSS), alkalinity, and TOC. PFC sampling requires special handling, and will be performed using EA SOP 073 (Appendix C), which documents proper sampling procedures. Additional surface water samples may be collected during future RI phases, and the analyte list may be adjusted, based on the results obtained during the Phase 1 RI sampling event.

The surface water and sediment samples collected under the Phase 1 RI field activities will be used primarily to identify complete exposure pathways to the adjacent drainage system, associated wetlands, and the closest stock pond situated east of the site. The results of the Phase 1 sampling event will be used to form the basis for subsequent sediment and surface water sample locations. Further information regarding the collection of surface water and sediment samples is provided under Section 2.3.4 of this SAP and in the Sampling Design Matrix (Appendix A).

***IDW Characterization and Disposal***—EA will characterize IDW at the end of the investigation activities. EA will then arrange for appropriate procurement and dispose of the IDW in accordance with local, state, and federal regulations. Further information regarding IDW characterization and disposal is provided under Section 2.3.9 of this SAP.

Future phases of the RI investigation may also include the following elements:

***Background Sampling***—Based on data collected during the Phase 1 RI field event, background sampling locations for soil, sediment, and surface water will be evaluated

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and the background samples will be collected from these areas, as necessary, during subsequent phases of the RI.

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**Biota Sampling**—During the Phase 1 RI field activities, EA does not plan to collect biota samples in the form of fish tissue and/or similar aquatic organisms. However, if data collected during the Phase 1 RI suggests the need for biota samples, they will be collected during subsequent phases of the RI field activities. Further information regarding biota sampling is provided under Section 2.3.5 of this SAP.

**Passive/Active Soil Gas Sampling**—EA will not collect PSG/ASG samples as part of the Phase 1 RI field activities. However, as necessary based on the Phase 1 RI results, sampling and analyses of soil gas samples may occur during subsequent phases of the RI field activities. Further information regarding passive/active soil gas sampling is provided under Section 2.3.2.2 of this SAP.

**Indoor Air Evaluation**—During the Phase 1 RI field activities, EA does not plan to conduct indoor air evaluations for structures located at or near the site. If data collected during the Phase 1 RI field activities suggest the need for an indoor air evaluation, it will be conducted during subsequent phases of the RI field activities. Further information regarding indoor air evaluations is provided under Section 2.3.6 of this SAP.

Table 4 describes the required sample volume, containers, preservatives, and holding times for sample analyses that may be required during the current and/or future phases of the RI field activities.

**Table 4. Analytical Parameters, Methods, Sample Volume and Holding Times**

Parameter	Method	Volume and Container	Preservatives	Holding Time
<b>AIR</b>				
Volatile Organic Compounds (VOCs)	EPA TO-15 (LL for soil gas and SIM for indoor air)	1 x 6-liter evacuated summa canister	None	30 days
<b>GROUNDWATER/GROUNDWATER AND/OR SURFACE WATER</b>				
Alkalinity	Standard Methods (SM)2320B	1 x 250-milliliter HDPE bottle	Store at <6°C (4±2°C)	14 days
Cyanide	CLP ISM02.4/ EPA SW9012B	1 x 1-Liter HDPE bottle	NaOH to pH>12; Store at <6°C (4±2°C)	14 days
Hardness	EPA Method 130.2	1 x 100-milliliter HDPE bottle	HNO <sub>3</sub> to pH ≤ 2; Store at <6°C (4±2°C)	180 days
Hexavalent Chromium	EPA Method 218.6	1 x 125-milliliter HDPE bottle	NH <sub>4</sub> OH (pH>9); Store at <6°C (4±2°C)	14 days

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Parameter	Method	Volume and Container	Preservatives	Holding Time
Metals (including mercury)	CLP ISM02.4/ EPA SW6010C/6020A/ 7470B	1 x 1-Liter HDPE bottle	HNO <sub>3</sub> to pH ≤ 2; Store at <6°C (4±2°C)	180 days (28 days for mercury)
Perfluorinated chemicals (PFCs)	EPA Method 537(M) Isotope	2 x 250 ml HDPE bottles	Store at <6°C (4±2°C)	14 days
Polychlorinated Biphenyls (PCBs)	CLP SOM02.4/ EPA SW8082	Two 1-liter amber glass bottles	Store at <6°C (4±2°C)	7 days
Semivolatile Organic Compounds (SVOCs)	CLP SOM02.4/ EPA SW8270D	2 x 1-Liter amber glass bottles	Store at <6°C (4±2°C)	7 days extraction, 40 days analysis
Total Dissolved Solids (TDS)	SM2540C/ EPA Method 160.1	1 x 1-liter HDPE bottle	Store at <6°C (4±2°C)	7 days
Total Suspended Solids (TSS)	SM2540D	1 x 1-liter HDPE bottle	Store at <6°C (4±2°C)	7 days
Total Organic Carbon (TOC)	SM 5310C	1 x 250-milliliter glass bottle	H <sub>2</sub> SO <sub>4</sub> to pH <2; Store at <6°C (4±2°C)	28 days
Total Petroleum Hydrocarbons (TPH)	TX1005	3 x 40-milliliter amber glass vials, 24-millimeter neck finish	HCl to pH ≤ 2; Store at <6°C (4±2°C)	14 days
VOCs (low-level)	CLP SOM02.4/ EPA SW8260C	3 x 40-milliliter amber glass vials, 24-millimeter neck finish	HCl to pH ≤ 2; Store at <6°C (4±2°C)	14 days
<b>SOIL AND/OR SEDIMENT</b>				
Acid volatile sulfide/ simultaneously extracted metals (AVS/SEM)	EPA 821/R-91-100/ EPA SW6010C/ SW9034	1 x 8-ounce amber glass jar (filled to capacity)	Store at <6°C (4±2°C)	14 days
Cyanide	CLP ISM02.4/ EPA SW9012B	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	14 days
Hexavalent Chromium	EPA SW3060/ 7199A	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	30 days
Metals (including mercury)	CLP ISM02.4/ EPA SW6010C/6020A/ 7471B	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	180 days (28 days for mercury)
Oxidation – Reduction Potential (ORP)	ASTM Method D1498	1 x 4-oz glass jar	Store <6 C (4±2°C)	14 days
PCBs	CLP SOM02.4/ EPA SW8082	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	365 days
PFCs	EPA Method 537(M)	1 x 8 ounce HDPE jar	Store at <6°C (4±2°C)	28 days
pH	EPA SW9045D	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	Analyze upon receipt
SVOCs	CLP SOM02.4/ EPA SW8270D	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	14 days

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Parameter	Method	Volume and Container	Preservatives	Holding Time
TPH	TX1005	Terracore Sample Kit containing 1 x 2-oz soil jar	Store at <6°C (4±2°C)	14 days
TOC	EPA SW9060A	1 x 8-ounce amber glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	28 days
VOCs	CLP SOM02.4/ EPA SW5035/ 8260C	3 x 40 milliliter vials (methanol and water) collected using 5-gram coring tool (e.g., Terracore or EnCore) samplers and 1 x 4-ounce glass jar	Store at <6°C (4±2°C)	48 hours/ 14 days
<b>INVESTIGATION-DERIVED WASTE SOIL AND WATER</b>				
Reactivity (Cyanide and Sulfide)-Water	EPA SW-846 Chapter 7/ SW9012B/ SW9034	1-Liter HDPE bottle	NaOH to pH>12; Zinc acetate and NaOH to pH>12; Store at <6°C (4±2°C);	14 days/ 7 days
Corrosivity (pH)-Soil	EPA SW9045D	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	Analyze upon receipt
Corrosivity (pH)-Water	EPA SW9045D	1 x 125-milliliter bottle	Store at <6°C (4±2°C)	Analyze upon receipt
Ignitability - Soil	EPA SW-846 Chapter 7	1 x 8-ounce glass jar with Teflon™-lined cap	Store at <6°C (4±2°C)	14 days
Ignitability - Water	EPA SW-846 Chapter 7/ EPA SW1010A	1 x 250-milliliter glass bottle	Store at <6°C (4±2°C)	14 days
TPH	TX Method 1005	One Terracore Sample Kit containing 1 x 2-oz soil jar (soil); 3 x 40-milliliter amber glass vials, 24-millimeter neck finish (water)	Store at <6°C (4±2°C) (solid); HCl to pH<2, Store at <6°C (4±2°C) (liquid)	14 days
TCLP Metals	EPA SW1311/6010C.7470 A	1 x 8-ounce glass jar with Teflon™-lined cap (solid); 1 x 1-Liter HDPE or glass container (liquid)	Store at <6°C (4±2°C) (solid); HNO3 to pH<2 Store at <6°C (4±2°C) (liquid)	180 days (28 days for Hg)
TCLP SVOCs	EPA SW1311/8270D	1 x 8-ounce glass jar with Teflon™-lined cap (solid); 1 x 1-Liter HDPE or glass container (liquid)	Store at <6°C (4±2°C)	14 days
TCLP VOCs	EPA SW1311/ 8260C	1 x 8-ounce glass jar with Teflon™-lined cap (solid); 1 x 1-Liter HDPE or glass container (liquid)	Store at <6°C (4±2°C) (solid); HCl to pH<2 Store at <6°C (4±2°C) (liquid)	14 days
TCLP VOCs	EPA SW1311/ 8260C	1 x 8-ounce glass jar with Teflon™-lined cap (solid); 1 x 1-Liter HDPE or glass container (liquid)	Store at <6°C (4±2°C) (solid); HCl to pH<2 Store at <6°C (4±2°C) (liquid)	14 days

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Parameter	Method	Volume and Container	Preservatives	Holding Time
<p>NOTES:</p> <p>Holding time is shown as the time from sample collection to the time of sample extraction/time from sample extraction to analysis (as appropriate).</p> <p>°C = Degrees Celsius</p> <p>CLP = Contract Laboratory Program</p> <p>EPA = U.S. Environmental Protection Agency</p> <p>HCl = Hydrochloric acid</p> <p>HDPE = High-density polyethylene</p> <p>Hg = Mercury</p> <p>HNO<sub>3</sub> = Nitric acid</p> <p>H<sub>2</sub>SO<sub>4</sub> = Sulfuric acid</p> <p>LL = Low Level</p> <p>NaOH = Sodium hydroxide</p> <p>NH<sub>4</sub>OH = Ammonium hydroxide</p> <p>SIM = Selective Ion Monitoring</p> <p>TCLP = Toxicity Characteristic Leaching Procedure</p>				

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Table 5 is a list of the existing onsite wells and new monitoring wells (to be installed) that will be sampled as part of the Phase 1 RI field activities. Figure A-1 (Appendix A) presents the existing onsite well and Phase 1 RI monitoring well locations. Some or all of these wells may be sampled in support of the RI as well as newly installed wells and existing wells that have not yet been sampled. The total number and location of wells to be sampled will be determined as more information is collected.

**Table 5. Existing Wells and Phase 1 RI Monitoring Wells to be Installed**

Wells
WW-1 – existing onsite well
WW-2 – existing onsite well
MW-1 – to be installed
MW-2 – to be installed
MW-3 – to be installed

## 2.2 MOBILIZATION

### 2.2.1 Mobilization

It is anticipated that each RI phase will include one mobilization with daily trips to/from the site. If needed, a second mobilization for a sampling team may be needed should newly installed monitor wells require additional time to recharge after development. Efforts will be made to coordinate and conduct multiple activities while teams are in the field.

Prior to mobilizing for a specific task, EA personnel will confirm that access has been granted for the required properties and subsurface clearance (utility locates) has been conducted in accordance with SOP 003 (Appendix C).

## 2.2.2 Site Access

Sampling activities will be performed on-site as well as privately-owned properties located within the City of Dallas. As necessary, EA will provide assistance to EPA to obtain consent for property access agreements from the private property owners that will be identified for investigation under the RI activities.

EA personnel will carry a copy of the signed access agreement with them in the field. EA will provide a 24-hour notice to property owners of the intent to access their property.

### 1.1.1 Underground Utilities Survey

An underground utilities survey will be conducted to clear all well and soil boring locations before any intrusive activities begin. The survey will include water distribution piping, telecommunications lines, storm sewer lines, sanitary sewer lines, industrial wastewater lines, gas lines, fire water lines, fuel product lines, and electrical lines.

### 1.1.2 Surveying

Newly installed wells and soil, sediment, and surface water sample locations will be surveyed after installation. At a minimum, easting, northing, ground surface elevation, and top of well casing elevations will be measured and reported. Horizontal coordinates of the monitoring well locations will be surveyed in-house to the nearest 0.1 ft. relative to State plane coordinates using Real Time Kinematic Global Positioning System survey methods. Elevations will be measured relative to mean sea level at ground surface to the nearest 0.1 ft.

## 2.3 SAMPLING METHODOLOGY

This section describes the procedures for sample collection, including sampling methods and equipment, sample preservation requirements, decontamination procedures, and management of IDW. Table 6 lists the SOPs that may be used for Phase 1 and future phases of the RI field activities. SOPs are provided in Appendix C.

**Table 6. Standard Operating Procedures**

SOP No.	SOP Title
001	Sample Labels
002	Chain-of-custody Form
003	Subsurface/Utility Clearance
004	Sample Packing and Shipping
005	Field Decontamination
006	Summa Canister Sampling
007	Surface Water Sampling

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SOP No.	SOP Title
008	pH Measurement
009	Temperature Measurement
010	Water Level Well Depth Measurements
011	Photoionization Detector
012	Specific Conductance Measurements
013	Monitoring Well Sample Collection
014	Collection of Production Well Samples
015	Document Control System
016	Surface Water, Groundwater, and Soil/Sediment Logbooks
019	Monitoring Well Installation
020	Active Soil Gas Sampling
021	Sediment Sampling
022	Sediment, Benthic Sampling, and Macroinvertebrate Sampling with Eckman Grad
023	Organic Vapor Analyzer
024	Photoionization Detector
025	Soil Sampling
026	Active Soil Gas Analysis
027A	Passive Soil Gas Survey – Gore Sorbers
027B	Passive Soil Gas Surveys - Petrex Technique
028	Well and Boring Abandonment
032	Piezometer Installation
033	Aquifer (Hydraulic) Testing
034	Drum Sampling
036	Turbidity Measurements
037	Dissolved Oxygen Measurements
038	Redox Potential Measurements
039	Sample Preservation and Container Requirements
042	Disposal of Investigation-Derived Material
043	Multi-Probe Water Quality Monitoring Instruments
046	Aqueous Diffusion Samplers
047	Direct-Push Technology Sampling
048	Low Flow Sampling
051	Low Flow Purge and Sampling Using Dedicated Pumps
054	Fish Tissue Analysis
059	Field Logbook
063	Chemical Data Management
064	Sediment Boring Logs
073	Sampling for Per- and Polyfluorinated Alkyl Substances

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SOP No.	SOP Title
NOTE: SOP = Standard operating procedure.	

### 2.3.1 Groundwater Sampling

EA will be collecting ~~ground water~~groundwater samples from the two existing onsite water wells and three new monitoring wells installed as part of the Phase 1 RI field activities. Table 5 provides a list of the current onsite wells and monitoring wells to be installed as part of the Phase 1 RI field activities. Other monitor and water wells may be installed and/or added for sampling in future RI phases based on the data collected. As indicated in the Sampling Design Matrix (Figure A-2 and Table A-1, Appendix A), the collected ~~ground water~~groundwater samples will be analyzed for TAL metals (total and dissolved), hexavalent chromium, ~~cyanide~~, and TDS. ~~Groundwater samples collected for dissolved metals will be field-filtered using 0.45-micron disposable filters.~~ During the Phase RI 1 sampling activities, a subset of these samples (40-20 percent) will also be analyzed for VOCs, SVOCs, ~~cyanide~~, PCBs (total and ~~arochlors~~), PFCs, and TPH. The wells will be sampled using low-flow sampling methods (SOP 048, Appendix C). ~~PFC sampling requires special handling, and will be performed using EA SOP 073 (Appendix C), which documents proper sampling procedures.~~

Additional monitoring wells may be installed in the future, and the analyte list may be adjusted during subsequent RI phases, based on the results obtained during the Phase 1 RI sampling event. Table 4 identifies the analytical methods and associated information such as sample containers, preservatives, and hold times for each method. If submitted to a private laboratory, an equivalent laboratory method will be used by that laboratory. The number of QC samples to be collected will be in accordance with the requirements set forth in this SAP and are summarized in Table 7.

**Table 7. Frequency of Field Quality Control Samples**

Field Quality Control Sample	Frequency <sup>(a)</sup>
Trip Blank	1 per cooler containing aqueous samples for volatile organic compound analysis
Field Blank	1 per day, if site conditions <del>are confirmed to render this sample necessary (high winds, VOCs volatiles are confirmed to be a COPC based on the Phase 1 sampling event) detected using a photoionization detector, etc.)</del>
Field Duplicate	1 per 10 samples
Equipment Rinse Blank	1 per non-dedicated equipment type per day or 1 per 20 samples
Matrix Spike/Matrix Spike Duplicate <sup>(b)</sup> (Organics)	1 per 20 samples (or per U.S. Environmental Protection Agency Region 6 Laboratory requirements)
Matrix Spike/Matrix Duplicate <sup>(b)</sup> (Inorganics)	1 per 10 samples (or per U.S. Environmental Protection Agency Region 6 Laboratory requirements)
Temperature Blank	1 per cooler

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Field Quality Control Sample	Frequency <sup>(a)</sup>
NOTES	
a. The quality control sample collection frequency applies to samples collected for fixed-laboratory analysis (EPA 2017a, 2017b).	
b. Matrix spike, and matrix spike duplicate, and <del>matrix duplicate</del> analyses are technically not field quality control samples; however, they require that the field personnel collect additional volumes of samples and are, therefore, included on this table for easy reference. The analytical laboratory will be contacted to determine sample volume requirements. Matrix spike samples will not be collected for alkalinity, hardness, TDS, TSS or TOC analyses.	

### 2.3.1.1 Water Supply Well Sampling

The two onsite water wells will be sampled as part of the Phase 1 RI field activities. Due to the wells being unused and depth to ~~ground-water~~ groundwater being relatively shallow, these wells will be sampled using the same sampling techniques for monitoring well sampling described below in Section 2.3.1.2.

If it is determined that other private and/or public water supply wells need to be sampled during future phases of the RI field activities, these wells will be purged and geochemical parameters monitored and logged using a calibrated water quality meter in accordance with SOP 014 (Appendix C). The parameters collected will include pH, temperature, and conductivity (SOPs 008, 009, and 012). These parameters will be measured for 15 minutes prior to sampling or until the readings have stabilized (conductivity within 10 percent, pH within plus or minus 0.5 pH unit, and temperature within plus or minus 1°C). Measurement of field parameters is further described in SOPs 008, 009, 012, 036, 037, 038, and 048 (Appendix C). The samples will be collected from the tap located closest to the well head and prior to a connection to a water treatment/filtration system. Field parameters will be recorded on field forms provided in Appendix E.

### 2.3.1.2 Monitoring Well Sampling

EA will purge and collect ~~ground-water~~ groundwater samples from monitoring wells using low-flow (i.e., micropurge using a submersible or peristaltic pump) sampling methodology (SOP 048, Appendix C). Low-flow sampling requires that minimal drawdown is maintained throughout purging of the well to ensure that the water being purged is in fact entering the pump from the formation, and not as a result of lowering water levels within the well. Water level measurements will be collected periodically to confirm that drawdown is not occurring in accordance with SOP No. 010 (Appendix C). Geochemical parameters will be monitored and logged using a calibrated water quality meter. ~~Ground-water~~ Groundwater will continue to be purged until measurements of temperature and conductivity have stabilized to within 10 percent, and pH has stabilized to within 0.1 pH unit. Other parameters will be monitored and recorded during purging, including turbidity and oxidation-reduction potential, but will not be used as stabilizing criteria. Measurement of field parameters is further described in SOP Nos. 008, 009, 012, 036, 037, 038, and 048 (Appendix C). Field parameters will be recorded on field forms provided in Appendix E.

## 2.3.2 Soil Investigation

### 2.3.2.1 Soil Borings

Soil borings will be installed and soil samples collected using either direct-push technology (DPT) (SOP 047, Appendix C), HSA drilling and sampling methods, or by use of hand augers. DPT and HSA drilling will be performed by licensed drillers. During the Phase 1 RI field activities, the soil borings will be installed and sampled to a total depth of 15 ft. bgs, or to refusal, whatever is encountered first; this depth may be adjusted during future phases of the RI field activities, based on the results obtained during Phase 1 of the RI.

During drilling, continuous soil cores will be collected. If using DPT, the soil core will be collected using clear PVC or acetate sleeves; two cores located adjacent to each other may be required at each soil boring location in order to obtain a sufficient volume of soil for laboratory analyses. If soil borings are advanced using HSA, the borings will be sampled continuously using split spoon sampler or a five-foot core barrel that is decontaminated between uses. In the event an area is not accessible for a DPT or HSA rig, a hand auger may also be used to collect shallow soil samples. A field geologist will log the material types within each core to assist in the understanding of site geology and for the nature and extent of contamination. Soil borings will be logged on standard boring log forms (Appendix E) using the Unified Soil Classification System methodology. During logging the field team will also field screen the samples using a photoionization detector (SOP 024, Appendix C) or organic vapor analyzed (SOP 23, Appendix C), will also make olfactory and visual observations of the collected soil cores, and record this data on the boring log form.

Soil samples will be collected for laboratory analyses following SOP 25 (Appendix C). These samples will be utilized for the characterization of the subsurface, delineation of the contamination, and the potential for contribution to ~~ground-water~~groundwater contamination (there is evidence of migration to ~~ground-water~~groundwater due to ~~ground-water~~groundwater contamination associated with the two onsite water wells).

Appendix A contains the Sampling Design Matrix for soil samples. Figure A-1 illustrates the soil sample locations for the monitoring well boreholes, Figure A-2 illustrates the soil boring sample locations, and Table A-2 summarizes the soil samples to be collected from each location. As indicated on this table, the following intervals of surface and subsurface soil will be sampled from the soil borings and retained for laboratory analyses for soil boring locations that are more distal from suspected source areas where COPCs may have migrated by way of shallow groundwater flow:

- 0.0 ft. to 0.5 ft.
- 0.5 ft. to 2.0 ft.
- Total Depth or refusal (the interval that is representative of 15 ft. bgs, or refusal, whichever is encountered first).

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For soil boring locations within/in close proximity to suspected source areas, the following intervals of surface and subsurface soil will be sampled from the soil borings and retained for laboratory analyses:

- 0.0 ft. to 0.5 ft.
- 0.5 ft. to 2.0 ft.
- 2.0 ft. to 5.0 ft.
- Total Depth or refusal (the interval that is representative of 15 ft. bgs, or refusal, whichever is encountered first).

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These intervals may be adjusted, and/or if warranted, additional intervals collected at some of these locations during future Phases of the RI.

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The Sampling Design Matrix (Table A-2, Appendix A) also specifies what metals and organic compounds the collected soil samples will be analyzed for. Figures A-1 and A-2 (Appendix A) illustrate soil sample locations for soil borings and monitoring wells. During the Phase 1 RI field activities, the collected soil samples will be analyzed for TAL metals, and hexavalent chromium, and cyanide. A subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, cyanide, PCBs (total and arylchlor), PFCs, TPH, ORP, and pH. Additional soil borings may be installed, and the analyte list may be adjusted during subsequent RI phases, based on the results obtained during the Phase 1 RI sampling event. Table 4 identifies the analytical methods and associated information such as sample containers, preservatives, and hold times for each method. If submitted to a private laboratory, an equivalent laboratory method will be used by that laboratory. The number of QC samples to be collected will be in accordance with the requirements set forth in this SAP, and are summarized in Table 7.

Following completion of sampling activities, soil borings will be abandoned in accordance with SOP 028 (Appendix C).

### 2.3.2.2 Passive/Active Soil Gas Investigations

Passive and/or active soil gas investigations are not currently planned for the Phase 1 RI field activities. However, a section for these types of investigations has been included in the SAP in the event collected data indicates the need to perform them during future phases of the RI field activities. If required in the future, ASG sampling probes will be installed and ASG sampling will be conducted in accordance with the soil gas point installation and sampling procedures in Appendix F. Field parameters will be recorded on field forms provided in Appendix E.

In the event it is determined a PSG investigation is warranted, PSG samplers will be installed either on straight line transects or in a grid pattern, with sample locations of 25 to 50 ft. spacing, depending on the length of the transects/grid areas, and the location of site features. The PSG samplers will be deployed in small diameter soil borings at depths ranging between 12 and 36 in. bgs. Borings will be advanced in the subsurface with an electric hammer drill equipped with a 1.25 – 1.5 in. diameter bit to 12-14 in. bgs and then proceed with 0.5 to 1 in. bit to 36 in. bgs or

refusal. After the boring is advanced to the desired depth, a hollow metal tube may be inserted into the boring to mitigate cave-in and facilitate sampler removal, then the PSG sampler will be lowered into the boring on a retrieval wire. A pin flag, grade stake, or similar marker will also be placed at each location (if possible), the boring sealed with aluminum foil, and the boring location covered. As necessary an amendment to this SAP will be prepared under separate cover if it is determined that a passive or active soil investigation is warranted.

### 2.3.3 Monitoring Well Installation

EA will supervise subcontractor installation, development, and surface completion of monitoring wells at the site. The locations of the wells will be selected based on site reconnaissance and existing site data. The well boreholes will be drilled (SOP 019) and soil samples collected (SOP 25) using HSA drilling methods for shallow monitoring wells.

During logging the field team will also screen the soil samples using a photoionization detector (SOP 024, Appendix C) or organic vapor monitor (SOP 23, Appendix C), make olfactory and visual observations, and record this data on the boring log form. The soil samples retained for laboratory analyses will be utilized for the characterization of the subsurface, further delineation of contamination, and the potential for contribution to ~~ground-water~~groundwater contamination. Appendix A contains the Sampling Design Matrix for soil samples (Table A-2); it also includes Figure A-1, which illustrates the monitoring well locations. As indicated on the Sampling Design Matrix for Phase 1 RI soil samples, the following intervals of surface and subsurface soil will sampled and retained for laboratory analyses:

- 0.0 ft. to 0.5 ft.
- 0.5 ft. to 2.0 ft.
- Highest Photoionization Detector reading/apparent ~~ground-water~~groundwater interface.

The Sampling Design Matrix for soil (Table A-2, Appendix A) also specifies what metals and organic compounds the collected soil samples will be analyzed for. During the Phase 1 RI field activities, the collected soil samples will be analyzed for TAL metals, ~~and hexavalent chromium, and cyanide.~~ A subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, ~~cyanide, PCBs (totals and aroclors),~~ PFCs, TPH, ORP, and pH. An undisturbed soil core will also be collected from the interval representing the apparent highest photoionization detector reading/apparent ~~ground-water~~groundwater interface for each monitoring well location, and this core will be analyzed for geotechnical parameters (bulk density, porosity, effective porosity, fraction organic carbon, and permeability).

Additional monitoring wells may be installed, and the analyte list for soil samples collected from them may be adjusted during subsequent RI phases, based on the results obtained during the Phase 1 RI sampling event. Table 4 identifies the analytical methods and associated information such as sample containers, preservatives, and hold times for each method. If submitted to a private laboratory, an equivalent laboratory method will be used by that laboratory. The number of QC samples to be collected will be in accordance with the requirements set forth in this SAP and are summarized in Table 7.

Phase 1 of the RI will include installation and sampling of three monitoring wells. The anticipated monitoring well design is installation of the monitoring wells to a maximum depth of 40 ft. bgs within the shallow alluvial aquifer beneath the site. However, the actual depth of the wells may be adjusted based on the depth the apparent ground-water/groundwater interface is encountered. Upon encountering the apparent ground-water/groundwater interface, the well borehole will be advanced 10 feet below this zone, and the well will be completed in such a way that it is screened across the ground-water/groundwater interface. This will prevent possible vertical migration of COPCs to deeper units and allow seasonal for fluctuations of ground water/groundwater within the screened interval of the monitoring wells. Based on the soil and ground-water/groundwater results obtained from these monitoring wells, the monitoring well network may be expanded during future phases of the RI field activities, in order to determine the nature and extent of ground-water/groundwater impact, and to determine whether or not the shallow ground-water/groundwater is discharging to the surface drainage systems located south and east of the site.

#### 2.3.3.1 Monitoring Well Borehole Advancement

Underground utilities clearance will be performed and necessary permits will be obtained prior to borehole drilling commencement. Before initiating drilling, the down-hole equipment, rig, and other equipment (as necessary) will be steam-cleaned or high-pressure washed, followed by a pressurized rinse with potable water to minimize the potential for cross contamination. Special attention should be given to the threaded section of the casings and to the drill rods. Cleaned equipment will not be handled with soiled gloves. Drilling equipment will be steam-cleaned or high-pressure washed at the completion of the project to ensure that no contamination is transported offsite. Decontamination of the equipment will follow general practices listed in SOP Nos. 005 and 019 (Appendix C). Water derived from decontamination will be collected and temporarily stored at the staging area for characterization.

All soil borings drilled will be continuously monitored. Lithologic logs will be prepared by examining the drill cuttings. Soil classifications will follow American Society for Testing and Materials International D2488-90 as provided in SOP No. 019.

Once the borehole is advanced to close proximity of the anticipated top of the water table (reportedly at approximately 10 ft. bgs), the site geologist will direct the driller to slow the rate of advancement, and the retrieved soil cores will be used to identify the apparent ground water/groundwater interface. Boreholes will be advanced to target depths relative to the water table and wells constructed so that they are screened across the apparent ground water/groundwater interface, and do not create a potential conduit to underlying units. Sampling, field screening, and logging shall continue to total depth of each borehole.

#### 2.3.3.2 Monitoring Well Construction

Conventional monitoring well construction will be performed by a Texas-licensed well driller.

Administrative requirements will be completed by the driller in accordance with rules and regulations as described in Texas Administrative Code (TAC) Title 16, Part 4, Chapter 76 (Water Well Drillers and Water Well Pump Installers Rules); TAC Title 30, Part 1, Chapter 330, Subchapter J (Groundwater Monitoring and Corrective Action); as well as rules and regulations prescribed by local authorities.

The monitoring wells will be installed using HSA drilling methods for shallow wells. Well construction methods are described in SOP No. 019 (Appendix C). After the estimated top of the saturated zone is identified by the Site Geologist, the well bore will be deepened to a depth of 10 ft. below this interval. The borehole will be advanced to a maximum total depth of 40 ft. bgs if the ~~ground-water~~ ~~ground~~ ~~water~~ interface is not apparent and suggests confining conditions within the shallow subsurface beneath the site. Boring/well construction logs will be recorded on field forms provided in Appendix E. The monitoring wells will be constructed using 2 in. PVC well casing and screen. It is currently anticipated that the well design will include 12 to 15 ft. of well screen, with the remainder of each monitoring well being constructed with riser. Lengths of well screen and riser may be adjusted, based on field conditions encountered.

### 2.3.3.3 Surface Completions

Depending on their location newly-installed monitoring wells will be constructed with either flush-mount or stickup surface completions. The flush-mounted surface completions will consist of 8 in. to 12-in.-diameter traffic-rated vaults set in 4-ft. by 4-ft. by 6-in.-thick concrete pads consisting of 4,000 pounds per square in. (psi)-rated concrete mix (Sackrete No. 10360 or equivalent, mixed to manufacturer's specifications) with a mat of No. 3 rebar on 12-in. centers. Concrete pads will slope away from the vault cover such that the vault cover elevation is 0.5 in. higher than the edges of the pad to allow for drainage of precipitation. A water-tight locking cap will be installed on each monitoring well.

For the stickup surface completions, a minimum 5 ft. protective casing (well monument) of either corrosion resistant material or painted with weather resistant paint shall be placed around the well. Approximately 2 ft. of protective casing will extend below grade, with 3 ft. extending above grade. The protective casing will have a locking cap and be designed to prevent the entrance of unauthorized personnel, rain, dust, or insects from entry, and threaded hole and drain plug at the base of the exposed portion of the casing, immediately above the top of the grout column. A concrete surface slab will surround the protective well casing and shall consist of 4,000 psi-rated concrete mix (Sackrete No. 10360 or equivalent, mixed to manufacturer's specification). The concrete pad will extend at least 2 ft. from the well in all directions, be a minimum of 6 in. thick with #3 rebar placed on 8 in. centers, and be sloped to drain away from the well. Protective posts, constructed of 6 in. diameter steel, shall be placed at all corners of the surface slab. Protective posts will be placed in 12 in. diameter boreholes, extend into the ground a minimum of 2 ft., and extend above grade a minimum of 3 ft. Posts will be placed in a 2 ft. concrete foundation and filled with concrete. The posts will be of sufficient strength to prevent vehicular damage to the well. Posts and protective casing will be yellow in color. Well heads will be capped with a locking vented cap.

### 2.3.3.4 Well Development

Monitoring wells will be developed following the completion of each well. The wells will be allowed to set 48 hours prior to initiating development. Downhole equipment, including surge blocks and/or pumps, will be decontaminated before first use at the site as well as in between wells. Water derived from decontamination will be collected and temporarily stored at the staging area for characterization.

Monitoring wells will be developed by surging and bailing, followed by pumping in accordance with SOP No. 019 (Appendix C). This process will continue until the wells yield relatively sediment-free ~~ground-water~~groundwater and field parameters have stabilized. Well development records will be documented on field forms provided in Appendix E.

### 2.3.4 Surface Water and Sediment Sampling

Surface water and sediment sampling activities will occur during the Phase 1 RI field activities. To the extent possible, surface water samples will be co-located with sediment sample locations. In the event surface water is not present at a sediment location, the surface water sample may be re-located to another area where only a surface water sample will be collected. The surface water and sediment samples collected under the Phase 1 RI field activities will be used primarily to identify complete exposure pathways to the adjacent drainage system, associated wetlands, and the closest stock pond situated east of the site. The results of the Phase 1 sampling event will be used to form the basis for subsequent sediment and surface water sample locations.

Appendix A contains the Sampling Design Matrix for sediment samples; it also includes Figure A-3, which illustrates the sediment sample locations. As indicated on the Sampling Design Matrix for Phase 1 sediment samples (Table A-3), the collected sediment samples will be analyzed for TAL metals, ~~and hexavalent chromium, and cyanide~~. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, ~~cyanide, PCBs (total and aroclors)~~, PFCs, TPH, ORP, pH, TOC, and AVS/SEM. Additional sediment samples may be collected, and the analyte list may be adjusted during subsequent RI phases, based on the results obtained during the Phase 1 RI sampling event.

Appendix A contains the Sampling Design Matrix for surface water samples (Table A-4); it also includes Figure A-4, which illustrates the surface water sample locations. As indicated on the Sampling Design Matrix for Phase 1 surface water, the surface water samples will be analyzed for TAL metals (total and dissolved), ~~and hexavalent chromium, and cyanide~~. ~~The groundwater samples collected for dissolved metals will be filtered during sample collection~~. During the Phase 1 sampling activities, a subset of these samples (10 percent) will also be analyzed for VOCs, SVOCs, ~~cyanide, PCBs (total and aroclors)~~, PFCs, TPH, hardness, TDS, TSS, alkalinity, and TOC. Additional surface water samples may be collected, and the analyte list may be adjusted during subsequent RI phases, based on the results obtained during the Phase 1 RI sampling event.



#### 2.3.4.1 Surface Water Sampling Methodology

Surface water samples will be collected directly into the sample containers in accordance with EA SOP 007 (Appendix C). An alternative sampling method involves pumping water from the sample location through dedicated Teflon™-lined polyethylene tubing using a peristaltic pump; the intake of the sample tubing will be placed 6 in. below the surface of the water. Surface water samples collected for dissolved metals will be field-filtered using 0.45-micron disposable filters. PFC sampling requires special handling, and will be performed using EA SOP 073 (Appendix C), which documents proper sampling procedures. Field parameters collected during surface water sample collection may include surface water flow rate, water temperature, pH, conductivity, TDS, ORP, and turbidity. Field forms are included in Appendix E. Coordinates for the sample locations will be obtained after sampling using a handheld global positioning system device. Sample locations may be adjusted based on existing field conditions.

#### 2.3.4.2 Sediment Sampling Methodology

Sediment samples will be collected using sediment core samplers with disposable sleeves or laboratory-grade disposable scoops, in accordance with SOP 021 (Appendix C). AVS-SEM sediment sample containers will be completely filled to minimize head space. Field forms are included in Appendix E. Coordinates for the sample locations will be obtained after sampling using a handheld global positioning system device. Sample locations may be adjusted based on existing field conditions.

#### 2.3.4.3 Surface Water and Sediment Sampling Program

Surface water and sediment samples will be collected from locations of suspected overland flow and potential points of entry into the surface drainage systems located immediately south and east of the site, and the pond located east of the site. If contaminant concentrations are below respective surface water and/or sediment screening criteria at a potential point of entry of discharge, then the investigation at that location will be considered complete as the nature and extent of contamination will be defined. However, if contaminants exceed screening criteria at a potential point of entry then the extent of contamination will not be defined, and the surface water and/or sediment sampling program will be expanded during future RI phases to investigate the nature and extent in the affected portions of the drainage systems.

Samples will be collected from each location using the following methodology and in accordance with the U.S. Geological Survey's (USGS) *National Field Manual for the Collection of Water-Quality Data* (USGS 2014):

1. Collocated surface water/sediment pairs will be collected from each location, unless otherwise specified above.
2. All sediment samples will be collected from 0.0–0.5 ft bgs.

3. All surface water samples will be collected from 0.0–0.5 ft or shallower below the water surface; due to the flow in the creek and tributaries, the mixing of the water column deems this sampling depth representative.
4. All surface water and sediment samples will be collected from each location at the same time while moving upstream from the confluences. This manner of sampling will ensure that the water and sediment at the upstream sampling locations are not disturbed due to ongoing sample collection occurring downstream.
5. Locations of the drainages from former potential sources of contamination will be verified. Surface soil and sediment samples will be collected from the points of confluence of the streams with these drainage pathways.

It is anticipated that, depending on the time of year, some surface drainage features may not contain surface water. If completely dry, only the sediment samples will be collected as per the strategy outlined above. If the bodies of water are dry, the sediment samples collected will also be evaluated for exposure as the surface soil exposure medium. If there is water ponding in the intermittent streams, collocated ponded water and sediment will be collected from available locations, but at a frequency of not more than 1 sample every 200 ft.

In order to be able to assess the appropriate exposure routes and receptors for each surface water body, sampling personnel will make a sufficiently detailed description of the vegetation surrounding the site and will note if there are any animals present or any traces of animal life. Based on these observations and information collected from the residents on how the surface water bodies are used (fishing, swimming, etc.), risk screening (and if screening criteria are exceeded, risk assessment) of a threat to the appropriate human and ecological receptors will be evaluated. The results for surface water and sediment samples will be also used to determine where biota samples will be collected during a subsequent mobilization (most likely, from the most contaminated locations).

If the wetlands survey indicates wetlands are present within the area of influence of the site, then additional surface water and sediment samples will be collected during a future phase of the RI field activities. Also, if the extent of contamination is not defined downstream, a plan for collecting additional samples will be developed and implemented during a subsequent phase of the RI field activities.

### 2.3.5 Biota

Although not currently planned or scoped for the site, but if determined necessary based on the collected Phase 1 RI data, collection and laboratory analyses of biota samples may be necessary. This investigation could include fish tissue samples collected from the site for total metals analysis, and/or benthic invertebrate tissue samples following bioaccumulation testing from sediment collected from the site (including 1 control sample). Fish tissue sample results will be used directly in the food-web calculations for piscivorous mammals and birds. Invertebrate tissue results will be used to derive site-specific bioaccumulation factors for the benthic

invertebrate food-web calculations. If necessary, fish samples will be collected and prepared using EA SOP 054 (Appendix C). As necessary an amendment to this SAP will be prepared under separate cover if it is determined that biota sampling and analysis is warranted.

### 2.3.6 Vapor Intrusion Investigation

Although not currently planned or scoped for the site, but if determined necessary based on the collected Phase 1 RI data, a potential vapor intrusion pathway investigation may be necessary. This will be completed by conducting sub-slab soil gas and indoor air sampling in onsite and/or nearby structures in the vicinity of the site. Sub-slab soil gas and indoor air samples will be collected in accordance with the vapor intrusion sampling procedures in Appendix F. Sub-slab soil gas samples will be used to evaluate the potential concentration of vadose zone source material and to evaluate the attenuation of vapors from source material into indoor air. Indoor air samples will also be used to evaluate the attenuation of vapors from source material to indoor air as well as provide an exposure point concentration for the building occupants. As necessary an amendment to this SAP will be prepared under separate cover if it is determined that a vapor intrusion investigation is warranted.

### 2.3.7 Sample Container, Volume, Preservation, and Holding Time Requirements

The required sample volume, container type, preservation technique, and holding time for each analysis to be conducted for samples are presented in Table 4. Required containers, preservation techniques, and holding times for field QC samples, are the same as for field samples.

### 2.3.8 Decontamination

Decontamination of the equipment will follow general practices listed in SOP No. 005 (Appendix C). Cleaned equipment will not be handled with soiled gloves. All water derived from decontamination will be collected and temporarily stored at the staging area established by EA for characterization.

### 2.3.9 Investigation-Derived Waste

Appendix A contains the Sampling Design Matrix for IDW samples. EA will incorporate best management practices for green remediation as it relates to the management of IDW. IDW will be characterized and managed in accordance with local, state, and federal laws, as applicable.

Soil will be drummed, sealed, labeled, and stored at the designated staging area until profiled for acceptance at an approved disposal facility (SOP No. 042, Appendix C). IDW soil samples will be submitted to an EA-subcontracted laboratory for disposal characterization. Landfill Disposal Restrictions will dictate sample quantities and analysis.

Water generated during well installation, ~~ground-water~~ groundwater sampling, aquifer testing, and equipment decontamination will be drummed, sealed, labeled, and stored at the designated staging area until profiled for acceptance at an approved disposal facility (SOP No. 042,

Appendix C). IDW water samples will be submitted to an EA-subcontracted laboratory for disposal characterization.

All IDW will be handled and disposed of in accordance with applicable regulations and requirements.

### 2.3.10 Sample Designation

Each sampling location will be designated with a unique alphanumeric designation according to the following sample classifications:

- **Soil Samples** – Soil sample designation will include three fields separated by dashes. For example: SO1-0.5-2.0. The first field, “SO1” identifies the sample type and number. The alpha characters are the designation for type of sample: Soil (“SO”). Soil samples collected from monitor well borings will keep the alpha characters associated with the well (“MW” for permanent monitoring wells). The first numerical character represents “0.5” represents the top of the sample interval measured in ft. bgs and the third field, “2.0” represents the bottom of the sample interval measured in ft. bgs.
- **Groundwater Samples** – Groundwater samples will first be identified based on the type of well. Samples collected from monitor wells will have a designation of “MW” and samples collected from water wells will have a designation of “WW”.
  - Monitor well groundwater sample designations will include two fields separated by a dash. For example: MW-03. The two alpha characters in the first field, “MW” identify the sample as having been collected from a monitoring well. The second field, “03,” represents the numerical designation for the monitor well number.
  - Water well groundwater sample designations will include two fields separated by a dash. For example: WW-01. The two alpha characters in the first field, “WW” identify the sample as having been collected from a water well. The second field, “01,” represents the numerical designation for a generic water well number assigned to each well sampled.
- **Surface Water Samples** – The surface water sample designation will include two fields separated by a dash. For example: LSW-01. The three alpha characters in the first field, “LSW” identify the sample as a Lane surface water (LSW) sample. The second field, “01” represents the numerical designation of the surface water sample.
- **Sediment Samples** – The surface water sample designation will include two fields separated by a dash. For example: LSE-01. The three alpha characters in the first field, “LSE” identify the sample as a Lane sediment (LSE) sample. The second field, “01” represents the numerical designation of the sediment surface water sample.

- **Biota Samples** – If biota samples are collected in the future, the sample designation will include three fields. For example: BIO-01-FSH. The three alpha characters in the first field, “BIO” identify the sample as a biota (BIO) sample. The second field, “01” represents the numerical designation of the biota sample, and the third field represents the sample type, either fish (FSH) or invertebrate (INV).
- **Active Soil Gas** – If ASG samples are collected in the future, designations will include two field separated by dashes. For example: ASG-1. The first field “ASG” identifies the sample type and the second is the distinct number for the sample location.
- **Passive Soil Gas** – If PSG samples are collected in the future, sample designations will include two field separated by dashes. For example: PSG-1. The first field “PSG” identifies the sample type and the second is the distinct number for the sample location.
- **Indoor Air** – If indoor air samples are required in the future, indoor air evaluation sample designations will include three separate fields separated by dashes. For example: A-IA-1. The first field “A” identifies the structure that is being evaluated. Generic structure names will be used and cross-referenced to actual addresses and/or building. The second field “IA” designates the type of sample, with the following designation to be used for these samples:
  - CS = Crawl Space vapor sample
  - IA = Indoor air sample
  - BG = Ambient air (outdoor sample)
  - SS = Sub-slab soil gas sample.

The third field designates the sample number.

- **Investigation-Derived Waste Sample Designation** – The designation for IDW samples will include three fields separated by dashes; for example: IDW-W-190902.
  - The two alpha characters in the first field, “IDW,” identifies that the sample is investigation derived waste.
  - The second field, “W,” designates it is a water sample; “S” will be used for the soil cuttings samples.
  - The third field, “190902190701,” represents the date in the following format YYMMDD, in this case 02 September 2019.

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### 2.3.11 Field Duplicate Sample Designation

Field duplicate samples will be identified by adding a “-D” to the end of the sample designations described above. For example: MW-02-D.

### 2.3.12 Matrix Spike/Matrix Spike Duplicate Sample Designation (for organic analyses)

MS and Matrix Spike Duplicate MSD organic samples will be additional volume for the MS and the MSD. They will be identified with the same identification as original sample identification. This will be noted as extra sample volume for these samples on the COC.

### 2.3.13 Matrix Spike/Matrix Duplicate Sample Designation (for inorganic analyses)

MS and Matrix Duplicate (MD) inorganic samples will be will be additional volume for the MS and the MSD. They will be identified with the same identification as original sample identification. This will be noted as extra sample volume for these samples on the COC.

### 2.3.14 Trip, Field, and Equipment Rinsate Blank Sample Designation

Field blank (FB), trip blank (TB), and equipment rinsate blank (ER) samples will be identified by two fields beginning with “FB”, “TB”, or “ER” respectively, followed by a dash “-”, then the sequential number for each type of sample. For example: TB-1, TB-2, TB-3; or ER-1, ER-2, ER-3.

## 2.4 SAMPLE HANDLING AND CUSTODY

Each sample collected by the EA field team will be traceable from the point of collection through analysis and final disposition to ensure sample integrity. Sample integrity helps to ensure the legal defensibility of the analytical data and subsequent conclusions. Sample handling will follow CLP protocols as required in EPA’s *Contract Laboratory Program Guidance for Field Samplers* (EPA 2014) provided in Appendix G. Appendix H contains Fact Sheet entitled “Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)” (ITRC 2018). This Fact Sheet provides and overview for collection and handling of samples undergoing PFC analyses.

EA will use EPA’s proprietary data management system “Scribe” to produce the COC records in the field for all laboratories. Applicable copies of generated Scribe files will be delivered to EPA data management personnel as required by CLP protocols.

### 2.4.1 Sample Documentation

Documentation during sampling is essential to ensure proper sample identification. EA personnel will adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black ink; however, chains of custody will be signed in blue ink

- All entries will be legible
- Errors will be corrected by crossing out with a single line, dating, and initialing
- Any documents will be maintained at EA and referenced in the site logbook
- Unused portions of pages will be crossed out, and each page will be signed and dated.

The EA field team leader is responsible for properly documenting sampling activities.

#### **2.4.1.1 Sample Labels**

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink:

- Project name and location
- Sample identification number
- Date and time of sample collection
- Sample collector's initials
- Analysis required.

#### **2.4.1.2 Chain-of-Custody**

EA will use standard sample custody procedures to maintain and document sample integrity during collection, transportation, storage, and analysis, following SOP Nos. 2 and 4 (Appendix C). A sample will be considered to be in custody if one of the following statements applies:

- It is in a person's physical possession or view
- It is in a secure area with restricted access
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The COC record will be generated by Scribe and will be used to document all samples collected and the analysis requested. Information that the field personnel will record on the chain-of-custody record includes:

- Project name and number

- Sampling location
- Name and signature of sampler
- Destination of samples (laboratory name)
- Sample identification number

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- Date and time of collection
- Analysis requested
- Signatures of individuals involved in custody transfer, including the date and time of transfer
- Air bill number (if applicable)
- Project contact and phone number.

Unused lines on the COC record will be crossed out. Field personnel will sign COC records that are initiated in the field and the airbill number will be recorded. The record will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. Signed chain-of-custodies will serve as evidence of custody transfer between field personnel and the courier, and between the courier and the laboratory. Copies of the COC record and airbill will be retained and filed by field personnel before the containers are shipped.

The following procedures will be implemented when samples collected during this project are shipped:

- The shipping box will be filled with bubble wrap, sample bottles, and packing material. Sufficient packing material will be used to prevent sample containers from breaking during shipment.
- The COC records will be placed inside a plastic bag. The bag will be sealed and taped to the inside of the cooler. The air bill, if required, will be filled out before the samples are handed over to the carrier. The laboratory will be notified if the sampler suspects that the sample contains any substance that would require laboratory personnel to take safety precautions.
- The shipping box will be closed and taped shut with strapping tape around both ends.
- Signed and dated custody seals will be placed on the front and side of each shipping box. Wide clear tape will be placed over the seals to prevent accidental breakage.



- \* The COC record will be transported within the taped sealed shipping box. When the shipping box is received at the analytical laboratory, laboratory personnel will open the shipping box and sign the COC record to document transfer of samples.

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## 2.5 ANALYTICAL METHODS REQUIREMENTS

The source of analytical services to be provided will be determined in part by DQOs and the intended use of the resulting data. EA will use EPA CLP, EPA-approved or other industry standard analytical methodologies for laboratory analyses of the samples.

EA will follow the analytical services request procedures that are outlined EA's Analytical Services Delivery Plan (EA 2005). If an analytical system fails, the QA Officer will be notified, and corrective action will be taken. Laboratory corrective actions will include stopping the analysis, examining instrument performance and sample preparation information, and determining the need to re-prepare and reanalyze the samples.

### 2.5.1 Field Analytical Methods

Water quality parameters that include pH, temperature, specific conductivity, ORP, and turbidity will be monitored using field-based methods during collection of ground-water/groundwater samples. In addition, ground-water/groundwater and surface water will also be monitored for dissolved oxygen content. EA will allow manufacturer-recommended procedures for operating field equipment. EA may field screen soils for organic vapors using a photoionization detector in accordance with SOP No. 024.

### 2.5.2 Fixed-Laboratory Analytical Methods

Fixed laboratory analyses of ground-water/groundwater, surface water, sediment, and soil samples will be conducted by the EPA Region 6 Laboratory, designated CLP laboratories, or EA-subcontracted commercial laboratory. PSG samples will be shipped to an EA-subcontracted laboratory for analysis. Table 4 outlines the anticipated laboratory analytical methods for samples collected for the Phase 1 RI. In all cases, appropriate methods of sample preparation, cleanup, and analyses are based on specific analytical parameters of interest, sample matrices, and required detection limits.

## 2.6 QUALITY CONTROL REQUIREMENTS

Various field and laboratory QC samples and measurements will be used to verify that analytical data meet the QA objectives. Field QC samples and measurements will be collected to assess the influence of sampling activities and measurements on data quality. Similarly, laboratory QC samples will be used to assess how the laboratory's analytical program influences data quality. This section describes the QC samples that are to be analyzed during the site sampling activities for: (1) each field and laboratory environmental measurement method, and (2) each sample matrix type. Table 3 presents the acceptance criteria for each type of QC sample, and Table 7 presents the frequency of QC samples to be collected at the site.

### 2.6.1 Field Quality Control Requirements

Field QC samples will be collected and analyzed to assess the quality of data that are generated by sampling activities. These samples will include laboratory QC samples collected in the field, field duplicates, equipment rinsates, field blanks and trip blanks for VOCs, and temperature blanks. Besides these samples, additional aliquot volume to be collected in the field for the laboratory to prepare laboratory QC samples such as MS/MSDs. Field QC sample requirements for fixed-laboratory analyses are presented in Table 7.

Field duplicates are independent samples that are collected as close as possible, in space and time, to the original investigative sample. Field duplicates can measure the influence of sampling and field procedures on the precision of an environmental measurement. They can also provide information on the heterogeneity of a sampling location. Field duplicates will be collected at a frequency of 1 for every 10 investigative samples, unless otherwise directed by EPA. Immediately following collection of the original sample, the field duplicates are collected using the same collection method.

Field blanks are collected to assess: (1) impact from ambient air conditions during sample collection; (2) cross-contamination during sample collection, preservation, and shipment, as well as in the laboratory; and (3) cleanliness of the sample containers. Field blank samples consist of sample containers provided by the laboratory and shipped to the field with the sample canisters. If contaminant is present in the blank samples above the MDL, the result for associated field samples that contain the same contaminant will be qualified as potentially not detected if the concentration of the field sample is less than the reporting limit. If required, field blank samples will be collected in accordance with the frequency listed in Table 7.

Trip blanks are collected to assess volatile organic cross contamination during sample storage and shipment, as well as in the laboratory. Trip blank samples consist of prefilled sample containers provided by the laboratory containing lab-grade purified water. If contamination is present in the blank samples above the MDL, the results for associated field samples that contain the same contaminant will be qualified as potentially not detected if the concentration of the field sample is less than the reporting limit. Trip blank samples will be collected in accordance with frequency listed in Table 7.

Equipment rinsate blanks are collected when non-dedicated or non-disposable sampling equipment is used to collect samples and put the samples into containers. These blanks assess the cleanliness of the sampling equipment and the effectiveness of equipment decontamination. Equipment rinsate blanks are collected by pouring analyte-free water over the decontaminated surfaces of sampling equipment that contacts sampling media. Equipment rinsate blanks are collected after sampling equipment has been decontaminated, but before the equipment is reused for sampling. If non-dedicated or non-disposable equipment is used, equipment rinsate blanks will be collected at a frequency as listed in Table 7.

MS and MSD samples are laboratory QC samples that are collected for organic methods, and MS and MD samples are collected for inorganic samples. In some cases, a portion of the private laboratories may also use LCS and LCSD as QC samples. For aqueous samples, MS/MSDs require double or triple the normal sample volume, depending on analytical laboratory specifications. In the laboratory, MS/MSDs are split and spiked with known amounts of analytes. Analytical results for MS/MSDs samples are used to measure the precision and accuracy of the laboratory's organic analytical program. These QC samples will be collected and analyzed at a frequency of one for every 20 investigative samples for CLP laboratories. EPA Region 6 laboratory or EA-subcontracted laboratories. MS/MSD samples will not be collected for alkalinity, hardness, TDS, TSS, and TOC sample analyses.

Temperature blanks are containers of water that are placed in each cooler shipped to the laboratory. Their purpose is to provide a container to test the temperature of the samples in the respective cooler upon receipt at the laboratory.

## 2.6.2 Laboratory Quality Control Requirements

All laboratories that perform analytical work under this project must adhere to a QA program that is used to monitor and control all laboratory QC activities. Each laboratory must have a written QA manual that describes the QA program in detail. The laboratory QA manager is responsible for ensuring that all laboratory internal QC checks are conducted in accordance with EPA methods and protocols, the laboratory's QA manual, and the requirements of this SAP.

Many of the laboratory QC procedures and requirements are described in EPA-approved analytical methods, laboratory method SOPs, and method guidance documents.

The EPA methods specify the preparation and analysis of QC samples, and may include, but are not limited to, the following types: (1) LCSs, (2) method blanks, (3) MS and MSD samples, (4) surrogate spikes, and (5) standard reference materials or independent check standards. The following subsections discuss the QC checks that will be required for this project.

### 2.6.2.1 Laboratory Control Sample

LCSs are thoroughly characterized, laboratory-generated samples that are used to monitor the laboratory's day-to-day performance of analytical methods. The results of LCS analyses are compared to well-defined laboratory control limits to determine whether the laboratory system

is in control for the particular method. If the system is not in control, corrective action will be implemented. Appropriate corrective actions will include: (1) stopping the analysis, (2) examining instrument performance or sample preparation and analysis information, and (3) determining whether samples should be re-prepared or reanalyzed.

#### 2.6.2.2 Method Blanks

Method blanks, which are also known as preparation blanks, are analyzed to assess the level of background interference or contamination in the analytical system and the level that may lead to elevated concentration levels or false-positive data. Method blanks will be required for laboratory analyses and will be prepared and analyzed at a frequency of one method blank per every 20 samples or one method blank per batch, if the batches consist of fewer than 20 samples.

A method blank consists of reagents that are specific to the analytical method and are carried through every aspect of the analytical procedure, including sample preparation, cleanup, and analysis. The results of the method blank analysis will be evaluated in conjunction with other QC information to determine the acceptability of the data generated for that batch of samples. Ideally, the concentration of a target analyte in the method blank will be below the reporting limit for that analyte. For some common laboratory contaminants, a higher concentration may be allowed.

If the method blank for any analysis is beyond control limits, the source of contamination must be investigated, and appropriate corrective action must be taken and documented. This investigation includes an evaluation of the data to determine the extent of the contamination and its effect on sampling results. If a method blank is within control limits but analysis indicates a concentration of analytes above the reporting limit, an investigation should be conducted to determine whether corrective action could eliminate an ongoing source of target analytes.

For organic and inorganic analyses, the concentration of target analytes in the method blank must be below the reporting limit for that analyte for the blank to be considered acceptable. An exception may be made for common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and phthalate esters) that may be present in the blank at up to five times the reporting limit. These compounds are frequently detected at low levels in method blanks from materials that are used to collect, prepare, and analyze samples for organic parameters.

#### 2.6.2.3 Matrix Spikes and Matrix Spike Duplicates

MS and MSD are aliquots of an environmental sample to which known concentrations of target analytes and compounds have been added. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis. If there are many target analytes, they will be divided into 2-3 spike standard solutions. Each spike standard solution will be used alternately. The MS, in addition to an unspiked aliquot, will be taken through the entire analytical procedure, and the recovery of the analytes will be calculated. Results will be expressed in terms of percent recoveries and RPD. The percent recoveries of the target analytes and compounds are calculated

and used to determine the effects of the matrix on the precision and accuracy of the method. The RPD between the MS and MSD results is used to evaluate method precision.

The MS/MSD is divided into three separate aliquots, two of which are spiked with known concentrations of target analytes. The two spiked aliquots, in addition to an unspiked sample aliquot, are analyzed separately, and the results are compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results will be expressed as RPD and percent recovery and compared to control limits that have been established for each analyte. If results fall outside control limits, corrective action will be performed.

#### 2.6.2.4 Surrogate Spikes

Surrogates are organic compounds that are similar to the analytes of interest in chemical properties but are not normally found in environmental samples. Surrogates are added to field and QC samples, before the samples are extracted, to assess the efficacy of the extraction procedure and to assess the bias that is introduced by the sample matrix. Results are reported in terms of percent recovery. Individual analytical methods may require sample reanalysis based on surrogate criteria.

The laboratory will use surrogate recoveries mainly to assess matrix effects on sample analysis. Obvious problems with sample preparation and analysis (such as evaporation to dryness or a leaking septum) that can lead to poor surrogate spike recoveries must be eliminated before low surrogate recoveries can be attributed to matrix effects.

### 2.7 INSTRUMENT AND EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

This section outlines testing, inspection, and maintenance procedures for field equipment and instruments and for laboratory instruments.

#### 2.7.1 General Requirements

Testing, inspection, and maintenance methods and frequency will be based on: (1) the type of instrument; (2) the instrument's stability characteristics; (3) the required accuracy, sensitivity, and precision of the instrument; (4) the instrument's intended use, considering project-specific DQOs; (5) manufacturer's recommendations; and (6) other conditions that affect measurement or operational control. For most instruments, preventive maintenance is performed in accordance with procedures and schedules recommended in: (1) the instrument manufacturer's literature or operating manual or (2) SOPs associated with particular applications of the instrument.

In some cases, testing, inspection, and maintenance procedures and schedules will differ from the manufacturer's specifications or SOPs. This can occur when a field instrument is used to make critical measurements or when the analytical methods that are associated with a laboratory instrument require more frequent testing, inspection, and maintenance.

### 2.7.2 Field Equipment and Instruments

Leased field equipment and instruments will be used to conduct field sampling and oversight activities. The vendor will be responsible for thoroughly checking and calibrating field equipment and instruments before they are shipped or transported to the field. Copies of testing, inspection, and maintenance procedures will be shipped to the field with the equipment and instruments.

After the field equipment and instruments arrive in the field, they will be inspected for damage. Damaged equipment and instruments will be replaced or repaired immediately. Battery-operated equipment will be checked to ensure full operating capacity; if needed, batteries will be recharged or replaced.

Following use, field equipment will be decontaminated properly before being returned to the source. When the equipment is returned, copies of any field notes regarding equipment problems will be included so that problems are not overlooked and any necessary equipment repairs are performed.

### 2.7.3 Laboratory Instruments

Laboratories that analyze samples collected under EA's EPA Region 6 RAC II program must have a preventive maintenance program that addresses: (1) testing, inspection, and maintenance procedures, and (2) the maintenance schedule for each measurement system and required support activity. This program is usually documented by an SOP for each analytical instrument that is to be used. Typically, the program will be laboratory-specific; however, it should follow requirements outlined in EPA-approved guidelines. Some of the basic requirements and components of such a program are as follows:

- ◆ As a part of its QA/QC program, each laboratory will conduct a routine preventive maintenance program to minimize instrument failure and other system malfunction.
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- An internal group of qualified personnel will maintain and repair instruments, equipment, tools, and gauges. Alternatively, manufacturers' representatives may provide scheduled instrument maintenance and emergency repair under a repair and maintenance contract.
- The laboratory will perform instrument maintenance on a regularly scheduled basis. The scheduled service of critical items should minimize the downtime of the measurement system. The laboratory will prepare a list of critical spare parts for each instrument. The laboratory will request the spare parts from the manufacturer and will store the parts.

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- Testing, inspection, and maintenance procedures described in laboratory SOPs will be performed in accordance with manufacturer's specifications and the requirements of the specific analytical methods that are used.
- Maintenance and service must be documented in service logbooks (or the site-specific logbook) to provide a history of maintenance records. A separate service logbook should be kept for each instrument; however, due to the limited scope of this project, the service records will be maintained in the site-specific field log book. Maintenance records will be traceable to the specific instrument, equipment, tool, or gauge.
- \* The laboratory will maintain and file records that are produced as a result of tests, inspections, or maintenance of laboratory instruments. These records will be available for review by internal and external laboratory system audits that are conducted under EA's EPA Region 6 RAC II program.

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## 2.8 INSTRUMENT CALIBRATION AND FREQUENCY

This section describes the procedures for maintaining the accuracy of field equipment and laboratory instruments that are used for field tests and laboratory analyses. The equipment and instruments should be calibrated before each use or, when not in use, on a scheduled periodic basis.

### 2.8.1 Field Equipment

EA will perform calibration of field equipment during the field activities specified herein. Calibration of the field equipment (e.g., multi-parameter water quality meter or photoionization detector) will be conducted on a daily basis following manufacturer recommendations and will be performed prior to sample analysis activities. Should readings appear to be questionable during sample analysis, EA will recalibrate the equipment as deemed necessary. The equipment calibration procedures described below will be followed.

Equipment will be maintained and calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications and with project-specific DQOs. Upon arrival of the field equipment, EA field personnel will examine it to verify that it is in good working condition. The manufacturer's operating manual and instructions that accompany the equipment will be consulted to ensure that calibration procedures are followed. Measuring and testing equipment may be calibrated either internally—by using in-house reference standards—or externally—by agencies, manufacturers, or commercial laboratories. Calibration records will contain a reference identifying the source of the procedure and, where feasible, the actual procedure. Each piece of measuring and testing equipment will also be accompanied by an equipment use log. The equipment use log (which may be contained within the site-specific field logbook) will be kept current and may contain the

following information: (1) date of use, (2) times of use, (3) operating and assisting technicians, (4) calibration status, and (5) comments.

### 2.8.2 Laboratory Instruments

Laboratory equipment that is used to analyze samples collected under EA's EPA Region 6 RAC II program will be calibrated on the basis of written SOPs that are maintained by the laboratory. Calibration records (including the dates and times of calibration and names of the personnel performing the calibration) will be filed at the location at which the analytical work was performed and maintained by the laboratory personnel who performed QC activities. Subcontractor laboratories may conduct laboratory work under EA's EPA Region 6 RAC II program. The laboratory QA Manager is responsible for ensuring that laboratory instruments are calibrated in accordance with the requirements of this SAP.

The laboratories will follow the method-specific calibration procedures and requirements for laboratory measurements. Calibration procedures and requirements will also be provided, as appropriate, for laboratory support equipment, such as balances, mercury thermometers, pH meters, and other equipment that is used to take chemical and physical measurements.

## 2.9 REQUIREMENTS FOR INSPECTION AND ACCEPTANCE OF SUPPLIES AND CONSUMABLES

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The EA Project Manager is responsible for identifying the types and quantities of supplies and consumables that are needed for collecting the samples for this Task Order. The Project Manager is also responsible for determining acceptance criteria for these items. Supplies and consumables can be received at an EA office, equipment distribution center or at the site. When supplies are received, the EA field personnel will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. In addition, a form will be completed describing the problem and circumstances, and noting the purchase order number of the item. Afterward, the item will be returned to the vendor for replacement or repair.

### 2.10 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

For this project, EA anticipates acquiring data from non-direct measurements such as databases, spreadsheets, and literature files.

### 2.11 DATA MANAGEMENT

A comprehensive data management program has been designed to assure that: (1) multiple information sources will result in similar data sets, and (2) data management practices will be adequate for the types of data processing required by a Task Order. Site team members will



follow these protocols to assure results will have uniform units of measure, analytical methods, and reporting forms.

Data for this project will be obtained from field measurements, EPA Region 6 Laboratory, a designated CLP laboratory, or an EA subcontracted laboratory. The data-gathering process requires a coordinated effort and will be conducted by project staff members in conjunction with all potential data producers. The data will be obtained from the EA subcontracted laboratory, when appropriate, in the form of an EDD, in addition to the required Level 4 type analytical data package. Formal verification (or validation) of data will be conducted before associated results are presented or are used in subsequent activities.

Data tracking is essential to ensure timely, cost-effective, and high quality results. Data tracking begins with sample COC. When the analytical service provider receives custody of the samples, the provider will send a sample acknowledgment to EA. The sample acknowledgment will confirm sample receipt, condition, and required analyses. The EPA tracking software (Scribe) will contain all pertinent information about each sample and can track the data at each phase of the process. The tracking software carries the data through completion of the data validation.

An EPA Stage 2B validation will be conducted on 100 percent of the Phase 1 RI analytical data generated by the EA subcontracted laboratory to ensure the data are accurate and defensible. All data will be evaluated for usability by EA in accordance with EPA CLP guidelines for data review (EPA 2017a, 2017b). IDW sample data will not undergo data validation but will be reviewed for compliance and completeness.

As a part of the data validation process, EDDs will be reviewed against hard copy deliverables to ensure accurate transfer of data. In addition, the hard copy will be evaluated for errors in the calculation of results. After data validation is complete, qualifiers can be placed on the data to indicate the usability of the data. These qualifiers will be placed into an electronic data file. Upon approval of the data set with the appropriate data qualifiers, the electronic data will be released to the Project Manager for reporting.

### 3. ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during this project, the individuals responsible for conducting assessments, corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to EA and EPA.

#### 3.1 ASSESSMENT AND RESPONSE ACTIONS

Under EA's EPA Region 6 RAC II program, performance and system audits of field and laboratory activities may be conducted to verify that sampling and analysis are performed in accordance with the following:

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### 3. ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during this project, the individuals responsible for conducting assessments, corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to EA and EPA.

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#### 3.1 ASSESSMENT AND RESPONSE ACTIONS

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Under EA's EPA Region 6 RAC II program, performance and system audits of field and laboratory activities may be conducted to verify that sampling and analysis are performed in accordance with the following:

- Performance and System Audits

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- Audit personnel
- Audit scope of work
- Audit frequencies
- Audit reports.

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- Corrective Action

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- Sample collection and field measurements
- Laboratory analyses.

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Non-conforming items and activities are those that do not meet the project requirements, procurement document criteria, and approved work procedures. Non-conformance may be detected and identified by the following personnel:

- Project personnel—During field operations, supervision of subcontractors, and field inspections
- Testing personnel—During preparation for and performance of tests, equipment calibration, and QC activities
- QA personnel—During the performance of audits, surveillance, and other QA activities.

Each non-conformance that affects quality will be documented by the person who identifies or originates the nonconformance. Documentation of non-conformance will include the following components:

- Description of nonconformance

- Identification of personnel who are responsible for correcting the nonconformance and, if verification is required, for verifying satisfactory resolution
- Method(s) for correcting the nonconformance (corrective action) or description of the variance granted
- Proposed schedule for completing the corrective action and the corrective action taken.

Nonconformance documentation will be made available to the Project Manager, QA Manager, and subcontractor (e.g., non-CLP subcontract laboratories) management personnel, as appropriate.

The field personnel and QA personnel, as appropriate, are responsible for notifying the Project Manager and the QA manager of each nonconformance. In addition, the Project Manager and the project staff, as appropriate, will be notified of significant nonconformance that could affect the results of the work. The Project Manager is responsible for determining whether the notification of EPA is required.

The completion of corrective actions for significant nonconformance will be documented by QA personnel during future auditing activities. Any significant recurring nonconformance will be evaluated by project and QA personnel, as appropriate, to determine its cause. Appropriate changes will be instituted, under corporate or project procedures, to prevent recurrence. When such an evaluation is performed, the results will be documented.

### 3.2 REPORTS TO MANAGEMENT

Effective management of environmental data collection operations requires timely assessment and review of measurement activities. It is essential that open communication, interaction, and feedback be maintained among all project participants, including the: (1) EA QA Manager, program manager, Project Manager, technical staff, and laboratory subcontractors and (2) EPA Region 6 TOM and QA Officer. EA prepares monthly progress reports for each Task Order that is conducted under EA's EPA Region 6 RAC II program. These reports address any QA issues that are specific to the Task Order and facilitate timely communication of such issues.

At the program level, the QA Manager prepares quarterly status reports of QA issues that are related to EA's work on EA's EPA Region 6 RAC II program. These reports are distributed to EA's President; corporate QA manager; RAC II program manager; and, upon request, EPA Region 6 project officer. QA status reports address the following areas:

- Results of QA audits and other inspections, including any quality improvement opportunities that have been identified for further action
- Instrument, equipment, or procedural problems that affect QA
- Subcontractor performance issues

- Corrective actions
- Status of previously reported activities and continuous quality improvement initiatives
- Work planned for the next reporting period.

#### 4. DATA VALIDATION AND USABILITY

This section describes the procedures that are planned to review, verify, and validate data acquired during this project. This section also discusses procedures for verifying that the data are sufficient to meet DQOs and measurement quality objectives for the project.

##### 4.1 DATA REVIEW AND REDUCTION REQUIREMENTS

Data reduction and review are essential functions for preparing data that can be used effectively to support project decisions and DQOs. These functions must be performed accurately and in accordance with EPA-approved procedures and techniques. Data reduction includes all computations and data manipulations that produce the final results that are used during the investigation. Data review includes all procedures that field or laboratory personnel conduct to ensure that measurement results are correct and acceptable in accordance with the QA objectives that are stated in this SAP. Field and laboratory measurement data reduction and review procedures and requirements are specified in previously discussed field and laboratory methods, SOPs, and guidance documents.

Field personnel will record, in a field logbook and/or on the appropriate field form (Appendix E), all raw data from chemical and physical field measurements. The EA field staff will have the primary responsibility for: (1) verifying that field measurements were made correctly, (2) confirming that sample collection and handling procedures specified in this project-specific SAP are followed, and (3) ensuring that all field data reduction and review procedures requirements are followed. The EA field staff is also responsible for assessing preliminary data quality and for advising the data user of any potential QA/QC problems with field data. If field data are used in a project report, data reduction methods will be fully documented in the report.

The EPA Region 6 laboratory, CLP laboratories, and/or EA subcontracted laboratories will complete data reduction for chemical and physical laboratory measurements and will complete an in-house review of all laboratory analytical results. The Laboratory QA manager will be responsible for ensuring that all laboratory data reduction and review procedures follow the requirements that are stated in this SAP. The Laboratory QA manager will also be responsible for assessing data quality and for advising the EA QA manager of possible QA/QC problems with laboratory data.

## 4.2 VALIDATION AND VERIFICATION METHODS

All data that are used to support activities under EA's EPA Region 6 RAC II program must be valid for their intended purposes. This section outlines the basic data validation procedures that will be followed for all field and laboratory measurements. The following subsections identify personnel who are responsible for data validation and the general data validation process and EPA data validation guidance that will be followed.

### 4.2.1 Data Validation Responsibilities

When analytical services are provided by laboratories subcontracted by EA, EA is responsible for data validation. The QA Manager has primary responsibility for coordinating EA's data validation activities. EA or an independent third-party subcontractor will perform an EPA Stage 2B validation on 100 percent of subcontractor laboratory data for the Phase 1 RI samples. Data validation will be completed by one or more experienced data reviewers or a third-party subcontractor. When data are generated by the EPA Region 6 Laboratory, it will be used as received from the laboratory, with no further validation. Data from CLP laboratories are validated by EPA's Environmental Services Assistance Team.

### 4.2.2 Data Validation Procedures

The validity of a data set is determined by comparing the data with a predetermined set of QC limits. Data reviewers will conduct a systematic review of the data for compliance with established QC limits (such as sensitivity, precision, and accuracy), on the basis of spike, duplicate, and blank sampling results that are provided by the laboratory. The data review will identify any out-of-control data points or omissions. Phase 1 RI data will be evaluated for compliance with the following criteria:

- Method and project-specific analytical service requests
- Holding times
- Initial and continuing calibration acceptance criteria
- Field, trip, equipment rinse and method blank acceptance criteria
- Surrogate recovery
- Field duplicates RPD
- MS and MSD acceptance criteria
- LCS and LCSD acceptance criteria

- Other laboratory QC criteria specified by the method or on the project-specific analytical service request form
- Compound identification and quantitation
- Overall assessment of data, in accordance with project-specific objectives.

The most current EPA CLP guidelines (EPA 2002, 2017a, 2017b) for completing data validation for all applicable test methods will be followed. General procedures in the CLP guidelines will be modified, as necessary, to fit the specific analytical method that is used to produce the data. In all cases, data validation requirements will depend on: (1) DQO levels that are defined in Section 1.3, (2) reporting requirements that are defined in Section 1.5, and (3) data deliverables that are requested from the laboratory, as discussed in Section 1.5.

#### 4.3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

The main purpose of a QA system is to define a process for collecting data that are of known quality, are scientifically valid, are legally defensible, and fully support decisions that will be based on the data. To achieve this purpose, the QAPP requires that DQOs be fully defined (Section 1.3). Other parts of the QA system must then be planned and implemented in a manner that is consistent with the DQOs. QA system components that follow directly from the DQOs include: (1) documentation and reporting requirements (Section 1.5), (2) sample process design and sampling methods requirements (Sections 2.1 through 2.4), (3) analytical methods and analytical service requests (Section 2.5), (4) QC requirements (Section 2.6), and (5) data reduction and validation and reporting methods (Sections 4.1 and 4.2).

After environmental data have been collected, reviewed, and validated, the data will undergo a final evaluation to determine whether the DQOs specified in this SAP have been met. EA will follow EPA's DQA process to verify that the type, quality, and quantity of data that are collected are appropriate for their intended use (EPA 2006a, 2006b, 2006c).

The DQA process involves: (1) verifying that the data have met the assumptions under which the data collection design and DQOs were developed, (2) taking appropriate corrective action if the assumptions have not been met, and (3) evaluating the extent to which the data support the decision that must be made so that scientifically valid and meaningful conclusions can be drawn from the data. To the extent possible, DQA methods and procedures that have been outlined by EPA will be followed (EPA 2006a, 2014) to verify that the type, quality, and quantity of data collected are appropriate for their intended (EPA 2000, 2006a).

EA will strive to follow EPA's DQA process to verify that the type, quality, and quantity of data collected are appropriate for their intended use. The DQA process includes five steps: (1) review the DQOs and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data.

When the five-step DQA process is not completely followed because the DQOs are qualitative, DQOs will systematically assess data quality and data usability. This assessment may include:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific data quality indicators for PARCCS and quantitation limits to determine whether acceptance criteria have been met.
- A review of project-specific DQOs to determine whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected. For example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence.

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## **FIGURES**

## Appendix A

### Sampling Design Matrix and Proposed Schedule

Figure A-1: Phase 1 Remedial Investigation Proposed Monitoring Well and Water Well Sample Locations

Table A-1: Sampling Design Matrix - Phase 1 Groundwater Sampling

Figure A-2: Phase 1 Remedial Investigation Proposed Soil Sample Locations

Table A-2: Sampling Design Matrix - Phase 1 Soil Sampling

Figure A-3: Phase 1 Remedial Investigation Proposed Sediment Sample Locations

Table A-3: Sampling Design Matrix - Phase 1 Sediment Sampling

Figure A-4: Phase 1 Remedial Investigation Proposed Surface Water Sample Locations

Table A-4: Sampling Design Matrix - Phase 1 Surface Water Sampling

Table A-5: Sampling Design Matrix – Investigation-Derived Waste Sampling  
Proposed Phase 1 Schedule

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## **Appendix B**

### **EPA Contract Laboratory Program Contract Required Quantitation Limits**

## **Appendix C**

### **Standard Operating Procedures**

Appendix D

Screening Values

Table D-1A: Screening Criteria for Soil and CLP Reference Limits

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Table D-1B: Screening Criteria for Soil and Private Laboratory Reference Limits

Table D-2A: Screening Criteria for ~~Ground Water~~Groundwater and CLP Reference Limits

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Table D-2B: Screening Criteria for ~~Ground Water~~Groundwater and Private Laboratory Reference Limits

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Table D-3A: Screening Criteria for Sediment and CLP Reference Limits

Table D-3B: Screening Criteria for Sediment and Private Laboratory Reference Limits

Table D-4A: Screening Criteria for Surface Water and Contract Laboratory Program Reference Limits

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Table D-4B: Screening Criteria for Surface Water and Private Laboratory Reference Limits

## **Appendix E**

### **Field Forms**

## **Appendix F**

### **Soil Gas and Indoor Air Sampling Procedures**

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**Appendix G**

**Field Samplers Guide**

## **Appendix H**

### **ITRC Fact Sheet for PFC Sampling, Handling, and Analysis**

**Appendix I**

**Response to Comments**